

The Effect of Unsolicited Online Product Feedback Orientation on
Product Development Success in the North American Consumer
Electronics Industry

by

Din Begovic

A thesis submitted to the Faculty of Graduate and Postdoctoral Affairs
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Management

© 2018

Din Begovic

ABSTRACT

Product development organizations develop both new and improved products with hopes that these products will succeed in the highly competitive consumer electronics industry. However, this task has become increasingly difficult as this industry experiences with fierce competition, increased product costs and complexity, decreased time to market and increased customer awareness. One method for improving product development success that is yet to be adopted readily is the integration of unsolicited online product feedback (UOPF) that is found online in the form of virtual community, social network and blog/vlog posts, and online product reviews. This study first examined the state of the current research on the topic including how and why product development organizations are using UOPF. Second, a model of the direct and mediating effects of UOPF orientation (UOPFO) on the process and product dimensions of product development success was tested. Results indicate that UOPFO is a full mediator of the effect of customer orientation on process success. Conversely, UOPFO is a partial mediator of the effect of cross-functional integration on process success. As was found in previous studies, the effect of customer orientation on product success was only observed for marketing managers and not for R&D managers. Surprisingly, no effect of UOPFO on product success was observed. Ultimately, UOPF is still an under-researched source of customer feedback that warrants additional academic attention through studies such as the one presented in this thesis document.

ACKNOWLEDGMENTS

I would like to dedicate this work to my family, including Gizmo the cat, who motivated me to complete my studies despite personal barriers that I had to overcome during this journey. I would also like to acknowledge the fruitful contributions of Professors Vinod and Uma Kumar during the comprehensive exam and dissertation stages. Finally, I would like to thank the faculty, staff, and other graduate students at the Sprott School of Business for providing assistance at various stages of my studies and for creating a great environment for academic and personal growth.

TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGMENTS	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	vii
LIST OF TABLES	viii
LIST OF APPENDICES	x
LIST OF ACRONYMS	xi
1.0 INTRODUCTION	1
1.1 Overview	1
1.2 Research Motivation and Objectives	4
1.3 Organization of the Document	7
2.0 CONCEPTUAL BACKGROUND	8
2.1 Product Development	8
2.1.1 Types of Product Development	9
2.1.2 Product Development Process Overview	11
2.1.3 Product Development Success	15
2.2 The Role of Customers in Product Development	19
2.2.1 The Evolving Role of Customers in Product Development	21
2.2.2 Customer Participation as a Driver of Product Demand	27

2.2.3	Other Product Development Success Factors	30
2.2.4	Benefits of Customer Feedback Integration	31
2.2.5	Barriers to Customer Feedback Integration.....	44
2.3	Unsolicited Online Product Feedback Typology.....	53
2.3.1	Traditional Versus Online Feedback.....	53
2.3.2	Solicited Versus Unsolicited Feedback.....	57
2.3.3	Sources of Unsolicited Online Product Feedback.....	60
2.3.4	Feedback Typology Summary.....	71
2.4	Customer Feedback Integration.....	72
2.4.1	Customer Orientation	73
2.4.2	Cross-Functional Integration.....	78
2.4.3	Organizational and Strategic Considerations	83
2.4.4	Best Practices for Customer Feedback Integration	89
2.5	Literature Review Summary.....	91
3.0	RESEARCH QUESTIONS.....	93
4.0	THEORETICAL FRAMEWORK OVERVIEW.....	95
4.1	Theoretical Underpinnings	95
4.2	Construct and Hypothesis Development	101
4.3	<i>A Priori</i> Model Development.....	106
5.0	RESEARCH METHODOLOGY.....	111
5.1	Research Sample and Data Collection.....	112
5.2	Variables.....	120

5.3	Measurement Development	121
6.0	ANALYSIS	129
6.1	Data Preparation	129
6.2	Measurement Model Unidimensionality	141
6.3	Measurement Model Reliability and Validity	150
6.4	Structural Model	155
6.5	Comparative Models.....	158
7.0	RESULTS	166
7.1	Descriptive Findings.....	166
7.2	Hypothesis Testing	181
8.0	DISCUSSION	185
9.0	CONCLUSION	190
9.1	Implications	190
9.2	Limitations.....	194
9.3	Directions for Future Studies.....	198
10.0	REFERENCES.....	200
11.0	APPENDICES	225

LIST OF FIGURES

Figure 1: Product development process stages as shown in Füller et al. (2006).....	12
Figure 2: Prahalad and Ramaswamy's (2004) view of customers in product development.	22
Figure 3: Chesbrough (2003) explanation of the traditional, closed innovation model.....	23
Figure 4: Jaworki and Kohli (1993) model of market orientation.....	75
Figure 5: Kirca et al. (2005) impact of market orientation on organizational performance.	77
Figure 6: The <i>a priori</i> framework for the role of UOPFO in product development.	108
Figure 7: SPSS AMOS output for CFA of the complete measurement model.	146
Figure 8: CFA item loadings and goodness-of-fit statistics for the CO construct.	148
Figure 9: CFA item loadings and goodness-of-fit statistics for the CFI construct.....	148
Figure 10: CFA item loadings and goodness-of-fit statistics for the UOPFO construct.....	149
Figure 11: CFA item loadings and goodness-of-fit statistics for the PRCS construct.	149
Figure 12: CFA item loadings and goodness-of-fit statistics for the PRDS construct.....	149
Figure 13: <i>A priori</i> structural model output from SPSS AMOS (n=198).	156
Figure 14: Final structural model output from SPSS AMOS (n=198).....	157
Figure 15: Structural model for marketing managers (n=93) in IBM AMOS.	161
Figure 16: Structural model for R&D managers (n=97) in IBM AMOS.....	162
Figure 17: Structural model for marketing managers (n=93) tested in SmartPLS.....	163
Figure 18: Structural model for R&D managers (n=97) tested in SmartPLS.	164
Figure 19: The final model of the effect of UOPFO on product development success.	182
Figure 20: Tassarolo (2007) model depicting the moderating impact of product vision.	225
Figure 21: Baker and Sinkula's (1999) model of learning and market orientation.	226

LIST OF TABLES

Table 1: Cooper and Kleinschmidt (2007) product development success categories.	31
Table 2: Benefits of customer feedback integration for product development success.	38
Table 3: Summary of barriers to customer feedback integration.	52
Table 4: Comparison of solicited and unsolicited feedback.	59
Table 5: Product feedback typology with examples of feedback sources.	72
Table 6: Organizational and strategic considerations for customer feedback integration.	88
Table 7: Summary of research hypotheses tested in the present study.	108
Table 8: SIC and NAICS codes for the consumer electronics industries studied.	113
Table 9: Research methodologies employed in notable product development studies.	115
Table 10: Literature sources of construct measurement scales ordered by date.	126
Table 11: Measurement item coding and questions for each variable.	128
Table 12: Descriptive summary of respondents.	130
Table 13: SPSS output of descriptive statistics and normality tests of measurement items. ..	137
Table 14: Summary of early and late respondent statistics.	138
Table 15: Levene's and student t-test comparisons of early and late respondents.	139
Table 16: Component matrix for UOPFO EFA.	142
Table 17: UOPFO EFA total variance explained.	142
Table 18: Exploratory Factor Analysis rotated component matrix.	143
Table 19: Goodness-of-fit values for the overall measurement model.	147
Table 20: Goodness-of-fit values for the individual measurement models.	150
Table 21: Cronbach's alpha and convergent reliability values.	152

Table 22: Convergent validity assessment.	154
Table 23: Correlation matrix and discriminant validity assessment.	155
Table 24: Goodness-of-fit values for the initial and final models.	158
Table 25: Summary of significant relationships for marketing and R&D models.	165
Table 26: Frequency of expected benefits of UOPF integration into product development. ..	169
Table 27: Frequency of observed benefits of UOPF integration into product development. ..	170
Table 28: Frequency of cited barriers to UOPF integration into product development.	174
Table 29: Ranking of preferences for using particular UOPF sources.	177
Table 30: Ranking of uses of UOPF in product development.	180
Table 31: Path analysis results with significant paths highlighted.	183
Table 32: Results of hypothesis testing. All significances were at $p < 0.001$ level.	184
Table 33: Mapping of research questions to survey questions.	241
Table 34: Mahalanobis distance and chi-square values for all completed surveys.	242

LIST OF APPENDICES

Appendix A: Tessarolo (2007) Framework.....	225
Appendix B: Baker and Sinkula (1999) Framework.....	226
Appendix C: Walmart Online Product Review Invite Email	227
Appendix D: BestBuy Online Product Review Invitation Email.....	228
Appendix E: Survey Invite	229
Appendix F: Survey Introduction.....	230
Appendix G: Survey Instrument.....	231
Appendix H: Measurement Item Mappings to Research Questions	241
Appendix I: Mahalanobis Distance	242
Appendix J: Free-Text Responses on Integration Benefits	244
Appendix K: Free-Text Responses on Integration Barriers	245

LIST OF ACRONYMS

AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Cross-functional Integration
CFU	Customer Feedback Unit
CO	Customer Orientation
EFA	Exploratory Factor Analysis
eWOM	Electronic Word-of-Mouth
NAICS	North American Industry Classification System
NPD	New Product Development
PCA	Principal Component Analysis
PRCS	Product Development Process Success
PRDS	Product Development Product Success
R&D	Research and Development
SEM	Structural Equation Modelling
SIC	Standard Industrial Classification
UOPF	Unsolicited Online Product Feedback
UOPFO	Unsolicited Online Product Feedback Orientation
WOM	Word-of-Mouth

1.0 INTRODUCTION

This section introduces the research topic examined in the present study and outlines the seminal research studies on product development and customer feedback. Finally, the discussion raised in this section explains the primary motivations for conducting the present study.

1.1 Overview

Product development organizations remain competitive by developing products that appeal to potential buyers. Schumpeter mentioned this fact succinctly in 1943 when he noted that “The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new customer goods, the new methods of production and transportation, the new markets, the new forms of industrial organization that capitalism creates” (Schumpeter, 2013, p. 83). Not surprisingly, past research found that more than 30% of revenue comes from products that are less than one year old (Griffin, 1997). Successful products can also establish the path for the development of multiple future versions of products as organizations can build upon the success of earlier versions of the products and the established customer base. As a result of this ever-increasing importance of developing successful new products, organizations have invested heavily into developing the technologies and competencies required to achieve product development success.

Research on product development came to prominence in the 1960s and had roots in a variety of disciplines including engineering management and marketing (Nambisan, 2003). Research into product development gained further traction in the 1980s when Japanese

researchers began identifying the key factors responsible for improving product development in several manufacturing and technology industries (Imai, Nonaka, & Takeuchi, 1985). Unfortunately, despite more than 50 years of research, product development remains as an extremely complex, costly, involving, and imperfect process (Bhaskaran & Krishnan, 2009; Griffin & Page, 1996; Primo & Amundson, 2002). For example, products that are expected to be major successes for an organization can result in lacklustre sales despite market analysts predicting the exact opposite. Furthermore, while it is imperative to develop products that satisfy customers, customer demands and preferences can change extremely rapidly, thus creating a moving target with respect to what the customers desire in a product (Jaworski & Kohli, 1993; Joshi & Sharma, 2004; Piller & Susumu, 2006). Not only are customer expectations constantly changing, but they have also increased over the years (Homburg, Workman Jr, & Jensen, 2002; Wirtz & Tomlin, 2000). Products themselves have also increased in complexity as they become comprised of increasingly complex sub-components (Primo & Amundson, 2002). Finally, given that complex products can require many years to be fully developed, the demand for such products may not even exist by the time that the finalized products are ready for sale. Unfortunately, simply increasing the research and development (R&D) expenditures in hopes of developing successful products is not a feasible option in a time of decreasing R&D budgets and innovation cycles (Gassmann & Enkel, 2004; Gassmann, Sandmeier, & Wecht, 2006).

The many challenges of product development are not surprising given that the business environment has been highly turbulent since the 1980s; largely due to the increased rate of technological change. In fact, Capon and Glazer (1987) discussed numerous consequences of technological change, the largest of which was arguably the rise and fall of entire industries.

Similar findings have been confirmed more recently, with Ye, Marinova and Singh (2007, p. 156) noting that “Change is fundamental to a modern business organization as a means to keep up with evolving market demands and to stay competitive”. This rapidly changing business environment has placed product development organizations under a constant pressure to increase the rate at which they develop successful new and improved products (Marsh & Stock, 2006). Not surprisingly, effective management of the product development process has been a subject of continued academic interest since the 1980s.

Despite the significant academic interest in product development, however, product development failure rates have remained high at approximately 40 to 75% (Sivadas & Dwyer, 2000; Stevens & Burley, 2003; Wind & Mahajan, 1997; Yeh, Pai, & Yang, 2010). As a result, prior research has attempted to remedy this deficiency by identifying the specific product development success factors that can improve product development on multiple dimensions of success including that of the process itself or the end product. Direct identification of these success factors provides the product development managers with practical applications of the product development research. One of the most frequently cited success factors in both marketing and product development literatures is that customers should be given a significant participatory and collaborative role in the product development process (Cooper & Kleinschmidt, 2007). As product development process is difficult to manage, customer participation holds significant potential for improving the historically low probability of product development success (Sandmeier, Morrison, & Gassmann, 2010).

1.2 Research Motivation and Objectives

The primary motivation for conducting this study has been the observation that there was a general lack of contemporary research on whether product development organizations were aware of the product feedback written by customers on a wide variety of social media such as: Facebook, YouTube, and Reddit. Social media is defined in this study as “an array of platforms that allow people to interact, create, share, and/or exchange information and issues in virtual communities and networks” (Carr et al., 2015). As product development process is difficult to manage, effective integration of customer feedback holds significant potential for improving the historically low probability of product development success (Sandmeier et al., 2010). Intriguingly, the author observed that even though customers would often identify serious problems or deficiencies with products, the problems would not be fixed for several generations or versions of the product. Given that poor product feedback has a proven negative impact on the prospective buyers' purchasing intentions, as will be discussed later in this thesis, it was perplexing to find recurring issues appearing in consecutive versions of products. Product development organizations could have analysed social media for abundant and freely available **unsolicited online product feedback (UOPF)** in the form of customer complaints, compliments, comments, and reviews. This would have placed them in a better position to resolve many of the most critical issues during product development, thus leading to more favourable product reviews, and ultimately, to greater product success.

One potential reason for such an omission, and one that will be examined in this study, stems from a possible absence of an orientation towards collecting and integrating UOPF into the product development process. By not integrating UOPF into their product development

process, product development organizations overlooked an important source of customer concerns and desires to be addressed in future products. Consequently, the main objective of the present study is to empirically test whether product development organizations that adopt a **UOPF orientation (UOPFO)** achieve higher levels of product development success.

The need for research into the practical implications of this topic was identified by Enkel et al. who remark that most of the research on customer integration has primarily focused on the marketing and customer relationship aspects rather than practical implications for managers (Enkel, Kausch, & Gassmann, 2005). Most recently, a review of 122 articles and books from 1987 to 2013 by Voorberg, Bekkers and Tummers (2015) confirms that prior research has rarely identified the specific outcomes of the interaction between customers and product development organizations. Even in the case of organizations that had invested heavily in formalized processes for collecting customer feedback, very few of these organizations were capable of using the gathered feedback to any meaningful degree (Fundin & Bergman, 2003) and most of these processes eventually became ineffective (Wirtz & Tomlin, 2000). As Fundin and Bergman (2003, p. 57) further explain, there is very little support of a "Systematic process for linking customer dissatisfaction [feedback] to new product development process and the planning of future products".

With respect to academic motivations, the present study is important as very little work has been conducted on describing and operationalising the UOPF construct, nor on determining the potential benefits of integrating UOPF into the product development process. Given that this form of feedback is very common, easy to acquire, and has a proven impact on the buying

intentions of other buyers, this is a severely under-researched area (Duncan, 2005; Sampson, 1996). The present study will rectify this deficiency by investigating whether higher levels of UOPFO lead to higher levels of product development success. Prior studies on the subject matter also did not typically focus on the consumer electronics industry. For example, Kahn (2001) focused on the impact of customer feedback integration in the textile industry, while Harmancioglu et al. (2007) concentrated on the building material industry. Finally, the present study builds upon the previous studies which only used a single-item measure or dimension of product development success. All of the above limitations lead to research on customer co-production being listed as one of the Marketing Science Institute's recent top-tier research priorities (Blazevic & Lievens, 2008; O'Hern & Rindfleisch, 2010). The role of social networks in product development and innovation is thus a "burgeoning" field of research since little work was done to understand how product development organizations link their internal processes to external customer networks (Nambisan & Sawhney, 2011).

In summary, the present study will address the identified shortcomings in the literature by examining the following questions:

- 1. Are product development organizations integrating UOPF into product development?**
- 2. What is driving or preventing organizations from integrating UOPF?**
- 3. How are organizations using UOPF in product development?**
- 4. Is there a link between UOPF integration and product development success?**

1.3 Organization of the Document

Remaining sections of this document are organized as follows: First, a detailed discussion of the relevant prior literature on the role of customer feedback in product development is provided in Section 2.0. With the topic background explained, several research questions are then presented in Section 3.0. Section 4.0 presents the theoretical framework and the hypotheses that frame and answer the research questions. Section 5.0 discusses the research methodology used to identify suitable respondents and to prepare data for analysis. Section 6.0 discusses in detail the analytical procedures performed on the data. Section 7.0 presents the descriptive and inferential results of the study. Finally, Sections 8.0 and 9.0 cover the discussion and conclusion sections, respectively.

2.0 CONCEPTUAL BACKGROUND

This section provides a literature review of relevant prior research on the role of customer feedback in product development. This background knowledge is of particular importance for developing the novel UOPF construct that is introduced and refined in this study. Subsection 2.1 discusses the nature of the product development process itself. Subsection 2.2 explains the role of customer feedback in product development. Subsection 2.3 describes the customer feedback typology including the UOPF construct that is the focus of this study. Subsection 2.4 provides a comprehensive discussion of prior literature that has investigated the exact processes involved in bringing customer feedback into product development organizations. Finally, Subsection 2.5 summarizes the background literature section.

It is also important to mention that multiple sources (search engines and journal repositories) were used to identify the most relevant prior research. The three primary sources used to gather research, in alphabetical order, were Business Source Complete®, Google Scholar™ and Scholar's Portal. Finally, all the research identified through these three sources was subsequently analysed for additional references of interest that were not identified during the initial literature search.

2.1 Product Development

The primary focus of the present study is on product development in the consumer electronics industry. Before venturing into the specifics of integrating UOPF feedback into product development, it is important to provide a detailed overview of the term “product

development”. Subsection 2.1.1 describes the differences between the two primary types of product development. Subsection 2.1.2 details the specifics of the product development process as it is frequently described in the literature. Finally, Subsection 2.1.3 provides a discussion of what product development success is and how it can be measured.

2.1.1 Types of Product Development

To begin, the concept of product development, often referred to as new product development (NPD) in the innovation literature, refers to the development of both evolutionary and revolutionary new products for either the business or customer markets (Quinn, 2000). This definition differs from the Product Development Management Association’s (PDMA) definition of NPD, which is said to be, “A product (good or service) that is new to the firm marketing it” (Kahn, Castellon, & Griffin, 2005). While the innovation literature has typically labeled NPD as solely focused on the development of radically new products, it is still possible for organizations to improve their existing products with new and improved features that were not present in the earlier versions of said products. As a result, much of the prior literature identified in the present study did not explicitly differentiate between the degree of innovativeness that was implied by the term “product development”. For example, Brown and Eisenhardt (1995) state in their seminal study that NPD focuses on structures and processes by which individuals create products, without detailing the specific types of products that were created. Thompke and Von Hippel (2002) use the broad term “product development” when discussing customer innovation, thus further exemplifying the ambiguity between the terms new product development and product development. Similarly, Olson, Walker, Ruekerf, and Bonnerd (2001) explain that uncertainty affects all new products regardless of how innovative they are, but more so the very

innovative ones. Finally, Hong, Doll, Nahm, and Li (2004) et al. use a combination of terms such as: new product development, product development, and integrated product development, to refer to the process of integrating customer feedback into the product development process.

The above discussion on degrees of innovativeness requires a more detailed explanation of the differences between the two main types of new products: Incremental or "evolutionary" products are those products that are minor improvements of already existing products. Radical or "revolutionary" products are those products that are significantly different from existing products and thus require substantial new knowledge to be developed (Dewar & Dutton, 1986). The development of radical products is more difficult to manage given that the product development organizations are dealing with numerous unknowns on the nature of the product offering. This type of development is a far more significant challenge compared to improving an existing product whose specifications and past performance in the market are already established (Dewar & Dutton, 1986). The distinction between these two types of products is important given that some researchers argue that customer feedback is more suitable for the improvement of existing products (Christensen, 1997; Cuevas-Rodríguez, Cabello-Medina, & Carmona-Lavado, 2013; Leonard-Barton, 1998; Von Hippel, 1986). Von Hippel and Christensen further argue that customers can even interfere with the generation of innovative ideas and should thus only be integrated into incremental product improvement efforts. Consequently, some researchers contend that incremental and radical innovation approaches are mutually exclusive; hence organizations cannot typically be engaged in developing both types of products simultaneously (Salavou & Lioukas, 2003).

Above assertions are also supported by marketing research such as that of Narver, Slater and MacLachlan (2004) who conducted investigations of market orientation where they separated market orientation into responsive (current needs) and proactive (future needs) orientation dimensions. Their findings show that a responsive market orientation alone is not a sufficient driver of product development success. Observe that this breakdown of market orientation into two dimensions parallels the breakdown of product development into incremental and radical innovation types. Product development organizations must, therefore, cater to both their current customers' needs, as well as proactively anticipating future needs and markets. Similarly, Atuahene-Gima, Slater, and Olson (2005) found that a proactive market orientation was strongly associated with product development success in organizations exhibiting high levels of marketing power and organizational learning.

2.1.2 Product Development Process Overview

Product development process refers to all of the steps required to develop products. These steps span from the initial market analysis and idea generation stages to the final commercialization of the product (Calantone, Vickery, & Dröge, 1995). Figure 1 shows Füller, Bartl, Ernst, and Mühlbacher (2008) diagrammatical representation of the archetypal product development process as a sequence of distinct stages. New products are assumed to pass through all the stages in sequence starting with the idea generation stage until the final product launch is achieved. Additionally, it is assumed that product development stages are separated from one another via stage gates (Cooper, 1990). Note that although some researchers, such as Cooper and Kleinschmidt (1986), provide a more detailed breakdown of different product development process sub-stages, such level of detail is not necessary for the present study.

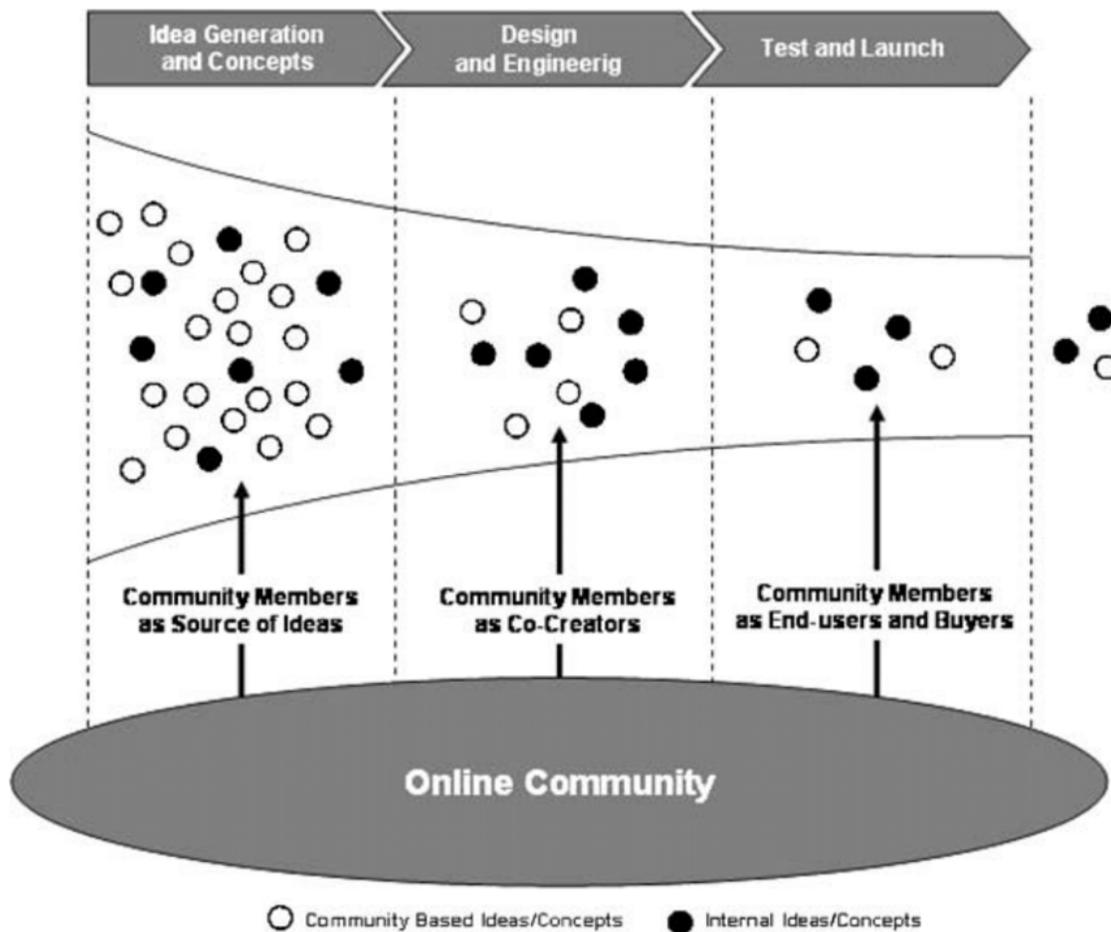


Figure 1: Product development process stages as shown in Füller et al. (2006).

In the present study, early stages of the product development process consist of the idea generation and conceptualization stages. Ernst, Hoyer and Rübsaamen (2010) refer to these two stages more generally as the “concept development stage”. It is during these stages that the ideas for new products are first formally defined based on the market research. Ideas for new products can either be entirely developed in-house or can come from sources external to the organization with only the modifications being performed at the early product development stages. Simply put, it is during these stages that questions such as, "What type of a product do the customers desire to buy?", “How can we improve our existing and future products?”, and "How can we

successfully develop this product in a rapid and efficient manner?" are answered. Hong et al. (2004) also state that knowledge integration should ideally occur in the early stages of the product development process in order to have the maximum impact on product development. This is because the early product development stages set the precedence for the characteristics of the final product and have an impact on the later stages of the product development process (Koen et al., 2001). For example, it has been stated that the later the changes are implemented in the product development process, the more costly and challenging they are to implement, as 80% of the final product development cost is locked-in during the initial stages of the product development process (Handfield, 1994). More significantly, Smith and Reinertsen (1991) found that delays in the commercial launch of even a few weeks can have a significant impact on the projected lifetime revenue of a product.

Consequently, some research estimates that inferior product designs can lead to as many as 40% of problems during a product's lifetime (Birou & Fawcett, 1994). A good example of this phenomenon occurs in the automotive industry where the design of a new car can be almost impossible to change late in product development and is often subject to costly recalls (Petersen, Handfield, & Ragatz, 2005). Therefore, it is of significant benefit for product development organizations to ensure that the early stages of their product development process are rapid and cost-effective. Unfortunately, early stages of the product development are often referred to as the "fuzzy front end" of the product development process since there is a significant amount of ambiguity that necessitates a need for information that can be used to develop new products (Dahan & Hauser, 2002; Murphy & Kumar, 1996, 1997). Improved understanding and successful management of the early stages of the product development process are therefore of

critical importance to the success of the overall product development process. Not surprisingly, the collection of customer feedback is critical during the early product development stages where it can help to reduce product development fuzziness (Ernst et al., 2010). The present study is focused on the early stages of the product development process since this is the point where customer ideas are integrated into the product development process.

With the importance of the early product development process stages highlighted in the previous paragraphs, it is pertinent to state that the later stages of the product development process, such as the design and engineering stages, are also important. For example, supplies account for 80% of all production costs (Birou & Fawcett, 1994). Additionally, the design and engineering stages are critical in testing prototype products to ensure that they are technically viable and in accordance to what the customers desire in a product (Krishnan & Ulrich, 2001). Failure to perform adequate testing before full production begins can be extremely costly as can be exemplified by the costs sustained by automakers during product recalls. Similarly, although Hong et al. (2004) found that knowledge integration should ideally be done early in the product development process, they still observed a positive impact of knowledge integration into the later stages since knowledge was used to refine prototypes prior to full-scale production.

In reality, it is difficult to generalize the product development process. For example, the stages of a typical product development process are not quite so distinct or unidirectional, because prior research has demonstrated that the later product development stages are in fact closely linked to the choices and decisions made during the initial stages (Handfield, 1994). The perceived importance of the various stages has also varied over time with the idea generation

stage gaining increased importance in recent years (Swink & Song, 2007). As Olson et al. (2001) state, every stage of the product development process has a specific set of “uncertainties and challenges” that need to be addressed. Finally, although the product development organizations generally follow all of the product development stages, not all of the organizations spend an equal amount of effort at each stage. However, organizations that follow the product development activities properly and go through all of the product development stages have historically had more product development success (Cooper & Kleinschmidt, 1986).

Despite the above limitations, the assumption that the product development process can be decomposed into separate stages will allow for a greater clarity on the generation and conceptualization stages of the product development process that this study is focusing on. The early stages of the product development process are also relatively universal since most product development processes have some form of an initial stage where market needs are identified and a product solution is developed. What tends to vary in the different models is predominantly the ordering and grouping of the various stages and the flow of the products through the stages (McCarthy, Tsinopoulos, Allen, & Rose-Anderssen, 2006). Consequently, the ideas examined in the present study could have applications for a variety of product development processes.

2.1.3 Product Development Success

The previous subsections described the product development process that converts product ideas and concepts into final products that are sold to customers. This subsection examines how product development can be evaluated as being successful or not. Foremost, it is important to clarify the often-overlooked differences between the terms “product development performance”

and “product development success”. Product development performance can be evaluated, and consequently improved, along several key dimensions such as: the technical performance of the final products, material costs involved, development time, and the overall project costs (Swink & Song, 2007; Wind & Mahajan, 1997). Another method of evaluating product development performance is in terms of improvement in the product development creativity levels (Kleinschmidt & Cooper, 1991). Each of these areas can be improved individually or in combination to improve the overall product development process itself and/or the final product. The critical point is that product development performance refers to a systemic and ongoing measurement of performance along specific product development evaluation criteria.

In contrast, the present study uses the **product development success** construct that considers the overall assessment of product development. Product development success is less comparable across organizations as each product development organization frequently uses subjective metrics and definitions of product development success. For example, Chen et al. (2010) explain that many product development organizations perceive product development process speed as the ultimate measure of the overall product development success. For other organizations, merely developing a product that is accepted by customers in a competitive marketplace is an assessment of success even if the product does not perform particularly well financially. However, as is often the case, product development success is ultimately perceived in the form of highly successful products that provide a significant and measurable return on the investment used to develop the products. Therefore, while product development performance and success concepts are related, they are not interchangeable.

Since the ultimate goal of the product development process is to create successful products, product development success construct can be subdivided into the sub-dimensions of process success and product success. This is a relatively rare approach in product development research since very little effort was made to investigate the multidimensionality of the product development success construct in prior studies. **Process success** has typically been measured using a number of quantifiable and objective metrics including cycle time, lead times, innovativeness, efficiency and effectiveness, along with the related references (Garrett, Buisson, & Yap, 2006). Of these, product development time is an important and frequently used measure for product development organizations since the rapid development of new products ensures that new products reach customers sooner, perhaps even before competitors' products do, thus increasing the product's competitiveness (Chen et al., 2010; Swink & Song, 2007; Tessarolo, 2007). Furthermore, a rapid development time extends a product's sale life and creates opportunities to charge a premium price (Tessarolo, 2007). A related measure of product development process success is the measure of the material costs involved, development time, and the overall project costs (Harmancioglu et al., 2007; Swink & Song, 2007). Another method of evaluating product development process success is in terms of improvement in the product development creativity or innovation levels (Kleinschmidt & Cooper, 1991; Marsh & Stock, 2006). (Kleinschmidt & Cooper, 1991) Needless to say, product development organizations can employ several of the above measures concurrently to more accurately assess product development process success.

For comparison, **product success** has generally been measured using subjective measures such as customer satisfaction (ratings) with products. For example, Marsh and Stock (2006)

employed a measure of how competitive an organization's product is compared to the competitors' products. Similarly, Wong and Tong (2011) assessed product success based on the responding managers' assessment of their products' success rates and profitability compared to that of their closest competitors' products. Wong and Tong did, however, give examples of prior research that also used "absolute", less subjective measures of product success, including sales revenue and return on investment. Dayan (2010) provides additional objective measures of product success including sales volume, profit and return on investment.

Overall, both the process success and product success dimensions of product development success have received attention in prior literature; but very rarely simultaneously. This finding is beneficial for the present study since product development process success and product success constructs have been operationalized and the measurement items and scales developed. Also, note that there is an inherent relationship between the process and product success dimensions since higher levels of process success lead to higher levels of product success. For example, as was stated above, a rapid product development process is said to be a successful process. A rapid product development process can also have a positive effect on product success since the products will reach the market sooner. Consequently, there is a well-established relationship between these two constructs that will be verified in the present study.

As can be deduced from the previous discussion, previous research has measured process success using both objective and subjective measures, which has led to inconstant results. Consequently, the present study is using objective measures of process and product success in order to reduce the possibility of conflicting findings on the importance of customer feedback

for product development success (Harris, 2001; Jaworski & Kohli, 1993; Kirca, Jayachandran, & Bearden, 2005). Jaworski and Kohli (1996) actually cautioned that future studies should expand on the research found in their study by employing additional objective measures of product development success that will further convince senior management of the benefits of integrating customer feedback into the product development process. However, as the authors themselves noted, the differences in findings could have arisen from the specific measures used and not due to intrinsic differences between objective and subjective measures. Due to this ongoing debate, the present study uses objective measurement items for all the constructs and variables. This approach should ensure that the nature of the measurement items does not limit the validity of observed relationships between the constructs examined in this study. Measurement development is discussed in detail in Subsection 5.3.

2.2 The Role of Customers in Product Development

The previous subsection described the product development process. However, although the product development organizations have a significant responsibility for developing products, they do not do so in a vacuum. Rather, in the current business environment, multiple supply chain members, such as suppliers and distributors, participate in the product development process. Although other research studies have considered the role of integrating feedback from other supply chain members into product development, the present study will only focus on feedback provided by customers. In the present study, the term “customers” refers to the end users of products who are interacting with and using the products. Finally, while the definition of a customer can be expanded to include dimensions such as how early a customer buys a new product, how actively they participate in providing feedback, or whether they experience needs

ahead of other customers, this study will not differentiate between customer types (Blazevic & Lievens, 2008; Brockhoff, 2003; Herstatt & Von Hippel, 1992).

Before discussing the role of customers in product development, it is important to point out a distinction between **customer feedback integration** and **customer integration** into the product development process. The present study examines how customer product feedback is collected by product development organizations and is then used internally in the product development process. Conversely, other researchers have focused specifically on methodologies used by product development organizations to work more intimately and on a continual basis with their customers (Kumar et al., 2010). These customer integration methodologies include quality function deployment (QFD), lead user method, and beta testing (Dahan & Hauser, 2002; Kaulio, 1998). Fuchs and Schreier (2011) discuss the various strategies that product development organizations can employ depending on how much control the customers are given to create the product designs and decide what products are ultimately developed. Therefore, customers can participate in product development as either sources of feedback or as full co-creators (Fang, Palmatier, & Evans, 2008; Piller, Vossen, & Ihl, 2012). Since customers can have multiple roles in product development, it is important for each product development organization to find the right balance between the level of customer integration and the associated difficulties. As Harmancioglu et al. (2007) point out, when it comes to product development, there is no “one-size-fits-all” solution.

The remainder of Subsection 2.2 is organized as follows: Subsection 2.2.1 describes the history of how customers were invited to participate directly in the product development process.

Subsection 2.2.2 provides an overview of how customers have an additional, indirect impact on product development. Finally, Subsections 2.2.4 and 2.2.5 detail the benefits of and barriers to integrating customer feedback into product development, respectively.

2.2.1 The Evolving Role of Customers in Product Development

Before the empirically verified link between customer feedback and product development success, Peter Drucker argued broadly in 1954 that creating a satisfied customer was the only valid business purpose (Day, 1994). One of the first academic attempts to directly investigate the importance of customer input into the product development process was done by Rothwell in 1974 (Nambisan, 2002; Rothwell, 1977). At approximately the same time, in 1977, Crawford proposed that marketing research can influence the new product success rate (Sethi, Smith, & Park, 2001). However, it was only in the 1980s that the majority of product development research began focusing on better understanding and satisfying customer demands (Jaworski & Kohli, 1996; Tassarolo, 2007). (Tassarolo, 2007) More recently, it has been stated that “Customers are fundamentally changing the dynamics of the marketplace” (Prahalad & Ramaswamy, 2000). Consequently, product development organizations and customers are currently engaging in active dialogue where both parties have a role in developing products (Orcik, Tekic, & Anisic, 2013).

Although largely taken for granted today, the increasing involvement of customers in the product development process was brought on by a significant paradigm shift from the traditional product development philosophies, shown in Figure 2, where customers were perceived to belong outside of the organization, and consequently, outside of the core product development

process (M. Porter, 1980; Prahalad & Ramaswamy, 2004). As Thompke and Von Hippel (2002, p. 78) observed, “Turning customers into innovators [required] no less than a radical change in management mindset”. The primary advantage of the traditional, closed innovation system was that organizations had greater control over innovation and also experienced lower transaction costs since only the internal coordination costs had to be considered (Sawhney & Prandelli, 2000). Consequently, the majority of the internal product development process improvement efforts were focused on the transaction-cost theory principles of reducing the production and transaction costs (Scott, 2003). Nambisan (2002) hypothesized that “poor connectivity” was one of the primary reasons for this disconnect between the product development organizations and their customers. Not surprisingly, Nambisan and Sawhney (2011) referred to this internally focused type of innovation as “firm-centric”.

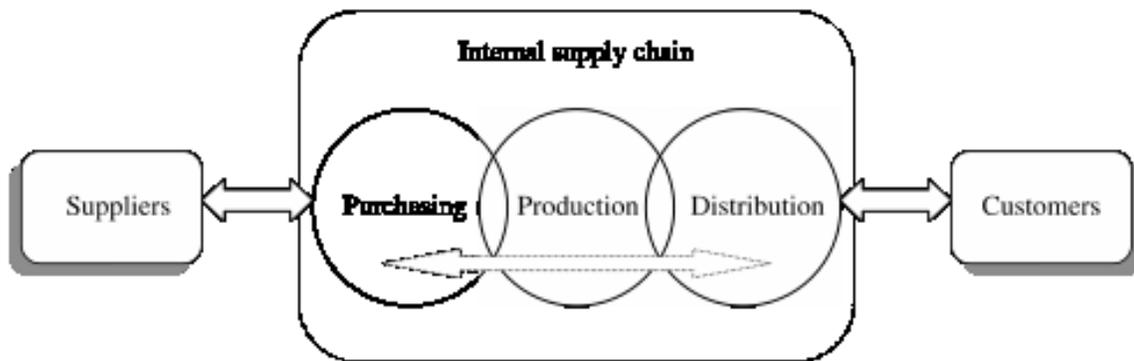


Figure 2: Prahalad and Ramaswamy’s (2004) view of customers in product development.

As a consequence of the above mentioned organizational paradigm, very little external knowledge flowed into the organizations and almost none of the knowledge developed within the organizations was released outside. Figure 3 demonstrates this idea using Chesbrough’s visualisation of the traditional, closed innovation model (Chesbrough, 2003). However, over

time, product development organizations began to realize that the internal R&D efforts were inadequate in capturing and understanding the vast amount of knowledge that was being created outside of their organizational borders (Wagner & Hoegl, 2006). Unsurprisingly, Thompke and Von Hippel describe the costly, traditional product development process as a, “Drawn out process of trial-and-error, often ping-ponging between manufacturer and customer” (Thompke & Von Hippel, 2002, p. 76).

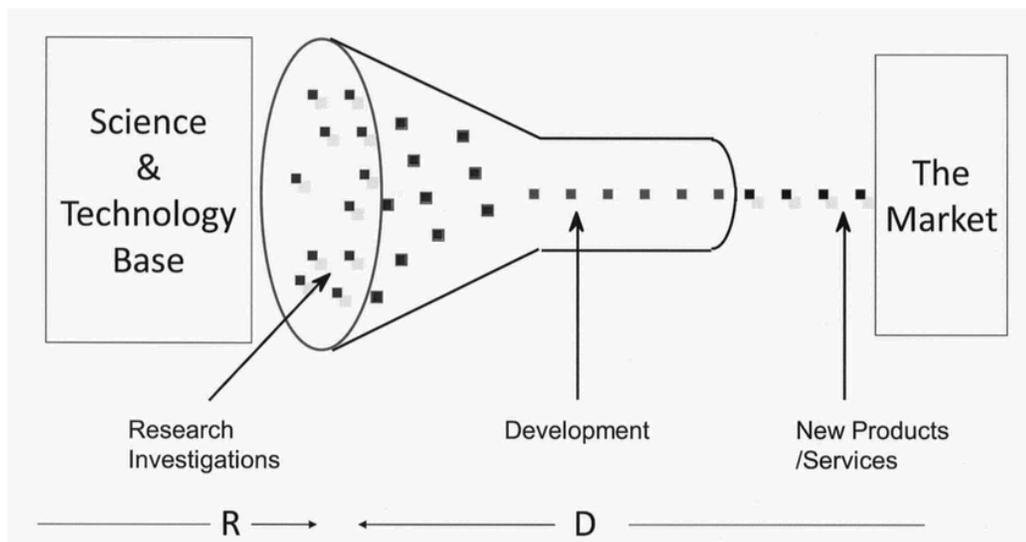


Figure 3: Chesbrough (2003) explanation of the traditional, closed innovation model.

Increased focus on the role of customers in product development was a significant departure from the traditional product development approaches where internal R&D teams were almost exclusively responsible for the development of new products (Thompke & Von Hippel, 2002). Product development organizations also began to realize that some customer ideas, even though they were not a good fit internally, could be spun-off as profitable external business entities (Chesbrough, 2003). Chesbrough’s book on open innovation was one of the first academic discussions that sought to examine the increased willingness of organizations to open their internal innovation process to external information and ideas; including that of their

customers. As Chesbrough (2003, p. 1) states, “Open innovation is the use of purposive inflows and outflows of [customer] knowledge to accelerate internal innovation and expands the markets for external use of innovation”. Other researchers supported Chesbrough’s ideas and called for increased “democratisation” of the product development process (Gassmann & Enkel, 2004; Pitt, Watson, Berthon, Wynn, & Zinkhan, 2006; Von Hippel, 2005; Von Hippel & Katz, 2002). The focus on customer input gained additional momentum due to a rise in popularity of business management philosophies such as Total Quality Management (TQM), which promoted a more holistic approach to managing the development of superior products (Kaulio, 1998). Although both the marketing and TQM research studies have examined the impact of customer integration on product development success, the TQM literature has traditionally provided the more prescriptive steps for implementing customer integration while the marketing literature focused on furthering the theoretical foundations of the domain (Day, 1994).

Contemporary viewpoint is that customers are highly informed on the specific nature of their issues or concerns with the products that they are using. While some customers can relate their problems in very technical terms, others present their problems from the perspective of a less knowledgeable user. It is interesting to note that while customers with high level of technical skills are frequently referred to as “prosumers” due to their professional level of knowledge, some researchers instead perceive the word “prosumers” to indicate customers that help to produce a product that they use (Pitt et al., 2006). In either situation, the important point is that these customers are providing feedback based on real-world product usage that is not influenced or controlled by product development organizations. Real-world usage of products is important, as one respondent in Blazevic and Lievens (2008, p. 147) study stated, “It is one of thing to

know how a product works, but it is another thing to know how a product works in the real world and in relation to other products”. As a result, significant academic and managerial discussion revolves around the idea that customer dissatisfaction can be a valuable source of product feedback for the improvement of existing products and the development of future products. For example, knowledge that is gained from customer feedback in the form of complaints can be used to rectify customer dissatisfaction either immediately via service recovery approaches or in future versions or models of products (Harrison-Walker, 2001; Litvin, Goldsmith, & Pan, 2008; Liu & Mattila, 2015; Plymire, 1991). Customer participation in product development is thus seen as a competitive advantage in a networked economy (Prahalad & Ramaswamy, 2004).

As customers were welcomed into the product development process, researchers also began investigating the development of semi-structured “communities of creation” where product development organizations and their partners could share in the knowledge creation process (Sawhney & Prandelli, 2000). These communities were started by both the customers themselves and by the product development organizations with the purpose of generating knowledge that was to be used in the early stages of product development. Recently, with the growth of the Internet, Füller, Bartl, Ernst and Mühlbacher (2006) explain that online communities can be integrated into all of the product development stages. For example, in addition to providing ideas for the idea generation and conceptualisation stages, customers could also evaluate ideas during the design and evaluation stage. These customers could ultimately serve as buyers of the products that they helped to develop. Nevertheless, the same authors found that prior literature on online communities has largely been restricted to applications of classical market research in the online context rather than using the feedback for product development

(Füller et al., 2006, 2008). This finding is not surprising, however, given that the capabilities of the Internet have grown significantly over the past decade. Additional discussion on the importance of online communities for product development will be discussed in a later section.

Recent studies have examined in detail the various industries where individuals can participate in the innovation and creation process. For example, prior studies examined the role of online customer feedback in service improvement, or new service development (NSD), much more frequently than has been the case for product development (Blazevic & Lievens, 2008; Bragge & Merisalo-Rantanen, 2002; Kumar et al., 2010; Liu & Mattila, 2015; Schneider & Bowen, 2010). A significant number of studies also exists in the domain of social innovation and public service co-creation that occurs between citizens and government institutions (Linders, 2012; Voorberg et al., 2015). Currently, a popular area of innovation research is the role of product development organizations' external networks in what is termed "network-centric" innovation (Nambisan & Sawhney, 2011). More relevant to the present study, a literature review of product development has identified various terminologies including: co-creation, co-production, co-innovation, community-based innovation, social innovation, crowdsourcing, and participation to describe the interactions between individuals and organizations. Some of these terms have relatively specific and consistent usage in research. For example, Prahalad and Ramaswamy (2004) are often credited for popularising the term "co-creation". The authors perceived co-creation as a specific process for sharing of ideas, comments, and knowledge. Social innovation is presented as a higher-level concept that covers the various, specific forms of interactions that are made possible by the power of the Internet. Voorberg et al. (2015, p. 2) define social innovation as "the creation of long-lasting outcomes that aim to address societal

needs by fundamentally changing the relationships, positions and rules between the involved stakeholders, through an open process of participation, exchange and collaboration with relevant stakeholders, including end users, thereby crossing organizational boundaries and jurisdictions.” Social product development is another name for the interactions between customers and product development organizations and is said “not to be the process of developing social products; rather, it is developing products socially” (Peterson & Schaefer, 2014). Finally, crowd-sourcing focuses on involving customers to solve specific problems (Brabham, 2008).

As can be deduced from the above discussion, there is no consensus on the exact definitions of each term and many terms appear to be used interchangeably (Voorberg et al., 2015). For example, some researchers argue that the word “participation” is more encompassing than “co-creation” or “co-production”, since participation can imply a passive role for customers (Prahalad & Ramaswamy, 2000; Voorberg et al., 2015). Since the present study is focused on UOPF, which is not directly solicited by the product development organizations, the chosen nomenclature uses the term participation rather than co-creation. Nevertheless, the fundamental and overarching idea that is developed in the present study is that the various forms of Internet-enabled interaction lead to increased and richer sharing of knowledge between customers and product development organizations.

2.2.2 Customer Participation as a Driver of Product Demand

In addition to providing feedback for the purpose of product development, the propensity of Internet use since the early-2000s has resulted in customers that are increasingly interconnected and knowledgeable about the products that they are planning to purchase (Dahan

& Hauser, 2002; Nambisan, 2002; Opoku, 2006; Piller & Susumu, 2006; Sawhney, Verona, & Prandelli, 2005). In fact, modern communication and information technology, and in particular the Internet, have significantly reduced the distances between parties in “both time and space, catalysing knowledge sharing and transfer” (Sawhney & Prandelli, 2000, p. 26). The importance of a connected customer base is that dissatisfied customers do not purchase future products from the same organization and also discourage others from making purchases. While it was traditionally assumed that a single dissatisfied customer could use word-of-mouth (WOM) communication to affect the buying intentions of up to seven additional customers, this ratio is no longer valid in the Internet age (Harrison-Walker, 2001). Nowadays, Internet connectivity can amplify the impact of a single dissatisfied comment to result in the loss of hundreds of other customers around the world (Kumar et al., 2010). This point is further emphasized given that it is approximately five times cheaper to retain customers rather than to attract new ones (Fundin & Bergman, 2003).

Today, WOM has been supplemented with electronic word-of-mouth (eWOM) that has far more reach and temporal permanence than the traditional word-of-mouth (Hennig-Thurau, Gwinner, Walsh, & Gremler, 2004; Litvin et al., 2008). With the aforementioned, Internet-enabled access to customers around the world, a single dissatisfied customer can use eWOM or "word of mouse" communication to influence the buying intentions of hundreds of prospective buyers (Dellarocas, 2003; Harrison-Walker, 2001). In turn, these prospective buyers could themselves inform other prospective buyers, and so forth. Blackshaw and Nazzaro (2006) perceive the millions of customers using social media to generate their own content as being powerful enough to counter the marketing efforts of the product development organizations

themselves. This finding is not surprising given that customers view eWOM feedback as being “independent of commercial influence” which they perceive as more trustworthy than information that is provided by the marketing departments of organizations (Litvin et al., 2008; O’Hern & Rindfleisch, 2010). Litvin et al. (2008, p. 10) further caution that, unlike traditional WOM, eWOM “exists in online space which can be accessed, linked and searched.” These properties apply to all types of UOPF and thus give it a tremendous amount of power to influence the buying intentions of potential buyers. In fact, prior research has even examined whether the feedback provided by customers could provide the best measure of product quality and usability (Hu, Pavlou, & Zhang, 2006). Unsurprisingly, customers tend to perceive product feedback written by other customers as more valuable than feedback originating from commercial or professional sources (Kusumasondjaja, Shanka, & Marchegiani, 2012). When customer confidence in professional marketing is low, as is the case in industries such as tourism and consumer electronics, eWOM can have a much more pronounced effect on the purchasing intentions of customers and product competitiveness than traditional advertising (Jalilvand & Samiei, 2012; Xiang & Gretzel, 2010). These factors place product development organizations under significant competitive pressures to increase and maintain high customer satisfaction levels through developing products that delight their customers.

In summary, although customers were not initially a major part of the product development process, product development organizations have become aware of the importance of customers and their product feedback. Customer feedback provides a rich source of knowledge that can be used to develop new or improved products. Customer feedback is also increasingly found on public websites that are viewable by other prospective customers whose purchasing intentions

are affected by the feedback, thus affecting the overall product sales (Cho, Im, Hiltz, & Fjermestad, 2002). Effective management of customer feedback is thus a critical competency for product development organizations. Next subsection provides a detailed overview of the benefits of customer feedback integration for product development process and product success dimensions.

2.2.3 Other Product Development Success Factors

In addition to examining the role of customers, product development research has outlined numerous other product development success factors (Troy, Hirunyawipada, & Paswan, 2008). Table 1 contains a summary of Cooper and Kleinschmidt (2007) product development success categories. As can be observed from this table, Cooper and Kleinschmidt described product development success from a holistic perspective consisting of multiple internally and externally focused factors. All of these factors are controllable by the product development organizations themselves, thus they were often examined in prior research in hopes of identifying how changes to these factors can increase product development success. The importance of presenting additional success factors is to explain that the role of customers in product development is one of many factors that can impact on product development success.

The present study considers strategic, new product development process and people categories of factors since the focus of this study are the organizational strategies that impact on product development success. Nevertheless, most of the focus is placed on the product development process category since the consumer electronics industry is turbulent and prior studies position the conversion of knowledge into the development of superior products as an

important source of competitive advantage in dynamic business environments (Brown & Eisenhardt, 1997; “CTA - U.S. Consumer Technology Sales & Forecasts 2012-2017,” 2017; Wong & Tong, 2011). Portfolio management and resource allocation category was not examined in the present study since it focuses on the tools and techniques that are used to select most promising projects out of a portfolio of possible projects.

Table 1: Cooper and Kleinschmidt (2007) product development success categories.

Success Factor Category	Description of Success Factors in Category
Strategic	Product innovation strategy, driven by the leadership team and its strategic vision for the business
Portfolio management and resource allocation	“Astute investment” of both funds and people from all functional areas
The new product development process	Robust process that emphasizes up-front homework, “voice-of-customer” input and quality of execution
People	Culture, climate, teams and the role of senior management

2.2.4 Benefits of Customer Feedback Integration

This subsection summarizes the prior literature on the benefits of customer feedback integration for **product development process success** and **product success** dimensions that were detailed in Subsection 2.1.3. Many of the benefits identified in this subsection were first identified in Kohli and Jaworski (1990) seminal study. Most of these benefits also conform to a recent study by He and Yan (2014) who used text mining of online content to uncover the most frequently discussed benefits of using customer feedback. Note that unless otherwise specified, the benefits stated in this subsection apply to various types of feedback including UOPF.

Benefits of Customer Feedback Integration for Process Success

The first benefit of customer feedback integration for product development is that it provides an input of knowledge into the development of future products that are not currently being developed or sold by an organization (Harrison-Walker, 2001). Specifically, customer product feedback has been increasingly seen as a critical source of knowledge by both the marketing and R&D departments of product development organizations (Harmancioglu et al., 2007; Kahn, 2001; Nambisan, 2002). For example, customer feedback frequently contains desires for particular features that could be added in the future generation or version of a product. Although product development organizations can often correctly predict features and problem fixes for their upcoming products, having the customer feedback in place can both support product development organizations' internally generated ideas and provide the organizations with brand new ideas. This is especially true in the case of latent customer needs which are not readily apparent. Narver et al. (2004, p. 336) state that these latent needs provide a source of competitive advantage since they cannot be readily known by all of the competitors. The authors further state that these needs can be obtained by monitoring data on “customer complaints, product returns, and warranty claims... which may comprise a basis for inferences of opportunities for additional ease-of-use services, for complimentary products, and so on.”

The above benefits are observed because product feedback that is obtained from customers around the world provides a much richer understanding of the various nuances that need to be considered when developing new products. For example, product design is a function of personal preferences and even socio-cultural norms, which presents difficulties for any individual organization's internal design department to fully capture and understand (Dell'Era & Verganti,

2009). Furthermore, the sheer number of actors [customers] providing product feedback and discussing products online could lead to greater levels of product “value creation per unit of time and space than ever before” (Hennig-Thurau et al., 2004; Normann & Ramirez, 1994). Although Normann and Ramirez (1994) focused on the broader implications of distributed processing and concurrent engineering, Ramirez (1999) subsequently stated that customers have a role in co-creating value together with organizations. Regarding measurable benefits, product development organizations that used customer feedback effectively in their internal product development process were better able to satisfy their customers through the development of superior products and, consequently, to perform better overall (Lusch & Laczniak, 1987).

Further related to this point, incorporating customer ideas early in the product development process is much more efficient than first developing products in-house and then only using customer feedback to evaluate new products at the prototype stage (Joshi & Sharma, 2004). Tessarolo (2007) provides an excellent summary of prior research on the impact that customers can have on the reduction in product development time. Product development time is reduced because the process of collecting and understanding information about products leads to learning which, in turn, increases the efficiency and effectiveness of product development (Chen et al., 2010). Moreover, the later the changes are implemented in the product development process, the more costly and difficult they are to implement, as 80% of the final product development cost is locked-in during the initial stages of the product development process (Handfield, 1994). Finally, prior research has estimated that inferior product designs in the early stages of product development can lead to as many as 40% of problems during the lifetime of a product (Birou & Fawcett, 1994). Therefore, improvement to product development process

speed through the incorporation of customer feedback is of critical importance for product development organizations.

More directly applicable for the present study on UOPF, Porter (2004) summarized prior research on the numerous potential benefits associated with using virtual (online) communities as a source of feedback, including more effective market segmentation, a better source of market research data, and greater support for new product development process. Füller et al. (2006) findings also show that between 3% and 15% of ideas provided by online customer communities were completely new to the internal R&D teams. More importantly, internal R&D teams rated these novel ideas as “highly attractive” on factors such as market potential and technical feasibility. Finally, obtaining customer feedback through UOPF is also relatively cheap since the product development organizations do not typically remunerate customers for passive feedback (Constantinides, Wittenberg, & Lorenzo-Romero, 2014). These findings provide the rare empirical evidence of the potential benefits of collecting and integrating UOPF into the product development process in addition to the internally generated product ideas. Not surprisingly, manufacturers such as Audi, Ducati, and Harley-Davidson have been using virtual communities as sources of innovation since the early 2000s (Fuchs & Schreier, 2011; Füller et al., 2008).

Satisfying customer needs can also serve as a source of pride and motivation for the internal product development teams (Kohli & Jaworski, 1990). Given that product development process is complex, time-consuming, and risky, an abundance of positive feedback from customers can be used to motivate the internal development teams to continue working towards

the collective goal of producing more successful products and satisfying the customers. Kohli and Jaworski (1990) further argue that by instilling a sense of pride and camaraderie among employees enhances organizational commitment, employee team spirit, and job satisfaction. In addition, focus on customer satisfaction can reduce role conflict by directly identifying employee expectations (Kirca et al., 2005). More directly related to this study, organizations that respond to UOPF in a friendly and caring manner can develop loyalty with their employees as well as their customers (Litvin et al., 2008). The benefits discussed in this subsection have focused on the impact of customer feedback including UOPF on product development process success. Next subsection will examine the impact of UOPF on product success.

Benefits of Customer Feedback Integration for Product Success

Unlike most traditional types of product feedback, the online, accessible, and persistent nature of UOPF means that it can also exert an influence on product success that is independent of the impact of UOPF on process success. This effect of UOPF on product success occurs as a result of product development organizations engaging in collecting UOPF and communicating with their customers. Porter summarized prior research on the numerous potential benefits of using virtual communities for product success including increased sales, positive word-of-mouth, and facilitation of stronger relationships between firms and their customers (C. E. Porter, 2004). All of these factors lead to greater product competitiveness in the highly competitive consumer electronics industry. More recent research has discussed additional benefits of managing online relationships on a wide variety of social media beyond just that of virtual communities (Piller et al., 2012). Most important of these benefits are discussed next.

First, the process of collecting and addressing UOPF can help to demonstrate to customers that the organization is genuinely interested in addressing their concerns. Customers often feel that product development organizations that seek their feedback and incorporate it into future products are genuinely interested in developing better products and satisfying their customers' needs (Kohli & Jaworski, 1990; Sawhney et al., 2005). It has further been argued that organizations that collect feedback tend to care more about increasing their customers' satisfaction; or at the least present an image of doing so. By increasing customer satisfaction, organizations develop loyalty among customers, which is in itself positively related to profit (Cho et al., 2002; Fecikova, 2004; Sawhney et al., 2005; Stauss & Neuhaus, 1997). Moreover, loyal customers that have a strong relationship with a particular product or organization will often overlook minor problems with products (Hayes, 2011). Loyal customers also provide more frequent and richer feedback that is more valuable for product development organizations (Liu & Mattila, 2015). Finally, product development organizations that manage their online relationships well are better able to engage customers that have a high chance of buying the new products (Füller et al., 2008; Gassmann, Kausch, & Ellen, 2010; Nambisan & Sawhney, 2011; Prahalad & Ramaswamy, 2000).

More significantly, Fuchs and Schreier (2011) found that organizations that listened to customer feedback had a positive response from their “periphery” customers that did not even provide the feedback themselves. This effect occurs because the intensely devoted and loyal customers often “broadcast” those brands that they strongly associate with (Pitt et al., 2006). Customers that have developed a particularly strong relationship with an organization might also provide help to other customers that are having issues with products (Kumar et al., 2010). These

customers are often found online as product experts who provide current and future customers with advice and solutions to problems. These highly eager customers might even become product or brand ambassadors, thus further augmenting product sales (Gorry & Westbrook, 2011). This eagerness to participate through feedback is noted by Opoku (2006) who perceives feedback as a fundamental human behaviour. Table 2 summarizes the benefits of customer feedback integration for product development process success and product success dimensions.

Table 2: Benefits of customer feedback integration for product development success.

Process or Product Success	Description of Benefit	Source
Process	Access to a large quantity of customer feedback	Normann and Ramirez, 1994; Hennig-Thurau et al., 2004;
	Access to feedback from a variety of customer segments	Dell’Era and Verganti, 2009
	Access to both incremental and radical innovation ideas	Narver et al., 2004; Füller et al., 2006
	Access to richer feedback	Porter, 2004; Füller et al., 2006
	Potential for decreased product development time	Joshi & Sharma, 2004; Tassarolo, 2007; Chen et al., 2010
	Potential for decreased product development costs	Birou and Fawcett, 1994; Handfield, 1994
	Positive feedback motivates product development teams	Kohli and Jaworski, 1990; Kirca et al., 2005; Litvin et al., 2008
	Product	Increased product price
Increased customer purchase intentions		Prahalad and Ramaswamy, 2000; Gassmann et al. 2010; Nambisan and Sawhney, 2011
Increased sales		Pitt et al., 2006; Kumar et al., 2010; Gorry and Westbrook, 2011; Fuchs and Schreier, 2011
Improved customer relationships		Kohli and Jaworski, 1990; Sawhney et al., 2005; Hayes, 2011
Positive brand development among the peripheral customers		Pitt et al., 2006; Kumar et al., 2010; Gorry and Westbrook, 2011; Fuchs and Schreier, 2011

Benefits for Customers

In addition to product development organizations, customers also stand to benefit from participating in the product development process. This observation is not surprising given that either the attainment of benefits or avoidance of consequences motivates customers to expand their time and energy to provide product feedback. In the case of solicited feedback, financial benefits to customers were one of the primary motivators for customers to provide product feedback to product development organizations (Constantinides et al., 2014). The motivators are not as immediately evident in the case of unsolicited feedback. Prior research has examined this subject in detail from the perspectives of the volunteer process model and uses and gratification theory, that discussion is outside the scope of the present study (Constantinides et al., 2014; Peddibhotla, 2013).

More immediately relevant for the present study, research on crowdsourcing, open-source development, and personal motivation theories provide insight into why customers provide feedback on their own time (Bitzer, Schrettl, & Schröder, 2007; Joshi & Sharma, 2004; Peddibhotla, 2013; Phang, Kankanhalli, & Tan, 2015; Pitt et al., 2006; Tong, Wang, Tan, & Teo, 2013). Friedman (2005, p. 97) quotes Marc Andreessen who is credited with inventing the mosaic browser as saying, “Open-source is nothing more than peer-reviewed science and they discover things, and the reward is reputation. Sometimes you can build a business out of it; sometimes they just want to increase the store of knowledge in the world. And the peer review part is critical – and open-source is peer review”. More specifically, Hennig-Thurau et al. (2004) examined 11 of the key customer motivators identified in the literature that impact on customer’s intention to provide feedback. Sethi et al. (2001) summarize the discussion to three key benefits

that customers can expect to gain from providing feedback for the product development process. These three key benefits cover the majority of motivators identified in the prior literature, thus providing a sufficient summary for the present study.

The first benefit for customers is that their actions could ultimately lead to the development of superior, future products with more appealing features (Sethi, 2000). For many customers, this is the single largest motivator for providing product feedback. After all, it is very often the dissatisfaction with a particular product that motivates individuals to seek out the means through which they can express their concerns and frustrations (Cho et al., 2002). Once new products are developed that better meet their needs, customers who expressed the initial feedback might purchase these improved products. A related benefit to customers is the possibility that their feedback could uncover ideas for completely new and innovative products that the customers may or may not have envisioned originally (Ulaga & Eggert, 2006). Grant (1996) explains that this reconfiguring of existing knowledge into completely new knowledge is a major source of competitive advantage in highly competitive industries. Therefore, customers who provide feedback could gain benefits over a long period of time and even across multiple product lines.

The second benefit for customers that provide feedback is based on altruistic motivations of reciprocity and mutual support where customers are interested in warning other potential customers about problems with a particular product (Axelrod, 2006). Marketing literature states these types of individuals feel rewarded by knowing that other customers will not repeat the same mistake of buying a faulty product (Hennig-Thurau et al., 2004). This benefit is critical for online shoppers due to a significant information asymmetry between online sellers and buyers

(Mackiewicz, 2010). A more cynical extension of this motivator would be that dissatisfied customers desire to take away sales from the organization that caused their disappointment (Funches, Markley, & Davis, 2009). Nielsen market research reports that 25% of respondents shared their experiences online to punish a company (“How Social Media Impacts Brand Marketing | Nielsen,” 2011). However, this particular reason for providing product feedback is largely a lose-lose scenario in the long-run as the product development organizations would lose potential customers which might dissuade the organizations from developing better, future products. Fortunately, customers can also let others know about how satisfied they are with a particular product, and approximately 60% of respondents stated that they shared their experiences online to “give recognition for a job well done” (“How Social Media Impacts Brand Marketing | Nielsen,” 2011). This is especially beneficial for identifying and recognising good products that might either not get proper praise or where the product development organization did not market the products effectively. Therefore, customers can either criticize or compliment products with the goal of informing other customers so that they can make a more informed purchasing decision. In either scenario, UOPF serves as the linkage between smaller, disconnected customers where the online feedback of multiple customers is combined into a single body of information (Dellarocas, 2003; Jespersen, 2011).

The third benefit for customers is the sense of accomplishment and pride that some of the more tech-savvy customers experience in providing technical feedback (Schneider & Bowen, 2010; Sethi, 2000). These individuals are highly motivated by peer recognition as the online community experts who are providing other online users with the “gift” of their wisdom and experience (Lampel & Bhalla, 2007). For example, in the open source literature,

acknowledgement of being the creator of a new feature is seen as a very strong driver of participating in online development communities (Bitzer et al., 2007). Furthermore, these individuals often feel strong associations with the brands of those communities where they participate (Pitt et al., 2006). Regarding UOPF, individuals that are motivated by this particular factor would be interested in having their online feedback rated as "useful" by other customers or perhaps being acknowledged as the product experts or top contributors in the community.

Of course, the most probable motivation for customers to provide product feedback, including UOPF, is related to a combination of the benefits mentioned above. Customers that are satisfied with a product might be primarily motivated by sharing their positive experiences, while in the case of bad experiences with products, these same customers might be motivated by wanting better products to be developed. Regardless of the particular motivation, however, the identification of the benefits provides the product development organizations with a much better understanding of why customers typically provide feedback and how they can be encouraged to do so more often. For example, websites that host customers' product reviews and online community posts can obtain more UOPF by providing various "ego boosting" means through which exemplary feedback is acknowledged (Peddibhotla, 2013). As an example, Amazon.com prominently displays the most helpful reviews on product description pages and allows their customers to rate the overall helpfulness of reviews.

Benefits for Feedback Hosting Services

Finally, although the prior literature has focused on explaining the benefits of UOPF for the product development organizations and their customers, there are also benefits for services (typically websites) that host UOPF. For the majority of services that are not directly associated with product development organizations themselves, the primary benefit of hosting UOPF is to drive increased traffic to the service thereby leading to increased advertising revenue (C. E. Porter, 2004). Most virtual communities and online social media are particularly driven by the prospect of becoming popular with visitors in order to command higher advertising revenue (Zeng, Huang, & Dou, 2009). One example of such a community is iLounge.com which hosts a wide variety of discussion forums on Apple products, even though the website itself is neither owned nor operated by Apple (Füller et al., 2008). A secondary motivation to host UOPF is the commission revenue gained from customers that click on advertisements on the page and subsequently purchase from the advertisers. Ultimately, this is a symbiotic relationship that is mutually beneficial for both the customers that are seeking information on products and the sites that are hosting UOPF.

Interestingly, in the case of online retailers that host UOPF, the primary benefit is the increased conversion rate for online purchases. Although only 26% of online retailers hosted UOPF in the form of online product review in 2006, 96% of these retailers found them useful in increasing the conversion rates (Barton, 2006). As was already discussed, the reasoning for this finding is that customer product reviews increase other individuals' confidence about their purchasing decision. This finding is especially true in the case of expensive online purchases where it is impossible, or at least extremely difficult, to try a product until after the sale and

delivery. For example, Litvin et al. (2008) explain that prior research has examined the importance of electronic reviews for the highly competitive tourism and hospitality industries because the products offered in these industries cannot typically be evaluated before. Consumer electronics products are also examples of high-involvement products since many customers purchase expensive electronic products online before having the ability to test the products, despite the high cost of these products (Gu, Park, & Konana, 2011). Online retailers appear to be aware of the importance of reviews since they have started contacting customers with automated emails requesting online product reviews. Examples of these automated requests for product reviews are shown in Appendices C and D. Ultimately, given that much of the identified literature on this rapidly evolving topic is decades out-of-date, it would be prudent to repeat these studies to verify the relevance of the previous findings in the current business environment. Anecdotally, at the time of the present study, most online retailers offer an ability for customers to create publically visible online product reviews.

2.2.5 Barriers to Customer Feedback Integration

With the benefits of customer feedback integration identified in the previous subsection, it is also important to discuss the potential barriers to integrating customer feedback into the product development process. This subsection first examines the general barriers associated with the integration of customer feedback and then focuses specifically on the barriers to UOPF integration. This subsection also provides some counterpoints for each of the stated barriers, thus demonstrating that the ideas discussed in this subsection are not beyond debate. As was the case with benefits, the barriers identified here generally match those summarized by He and Yan (2014) study of online discussions.

General Barriers to Customer Feedback Integration

A significant portion of the debate on the usefulness of customer feedback in product development stems from Von Hippel (1986) classic contention that customers typically do not know what that they actually desire in a product; especially a highly innovative product. The consequence of this argument is that product development organizations that place too much emphasis on satisfying their current customers' needs will fail to capture future markets and might even lose their current customer base once competitors' products become better at satisfying the customers' needs. The notion that customers do not fully understand their future needs is a fair one as it has abundant real-life examples (Gassmann et al., 2010). For example, customers that bought mainframe computer systems focused on providing improvement suggestions based on their existing, mainframe-based concept of what they needed in a product. Due to this limited and myopic view of products, these same customers did not perceive future where small personal computers could meet their needs. Organizations that only addressed their existing customers' feedback were eventually superseded by organizations that better predicted the long-term change in customer needs and preferences. Similarly, Lin and Huang (2012) recent research found that customer participation in product development enhances efficiency and effectiveness, but also limits innovativeness, which supports Von Hippel's earlier ideas (Lin & Huang, 2012). Therefore, although listening to customer feedback was the correct move initially, it ultimately proved disastrous for organizations that never focused on the "next big thing" that did not involve their current customer base. Hamel and Prahalad (1990) refer to this phenomenon as the "tyranny of the served market".

What this barrier does not state is that incremental innovation is a negative outcome of customer integration. Rather, the barrier is related to innovation mismanagement, which occurs due to product development organizations focusing exclusively on incremental innovation. For example, Urban and Von Hippel (1988) found that customer integration actually increases a company's potential for innovation; when the integration is managed properly with respect to the types of customers that are integrated. Social capital research also promotes careful management of the external social capital that is developed between product development organization and their customers in order to enhance innovation (Cuevas-Rodríguez et al., 2013). Furthermore, a large number of incremental suggestions for improvement can lead to radical innovation when they result in a radical rethinking of the solution to a particular problem (Von Hippel & Katz, 2002).

Second, although customer feedback has been seen as a very significant source of information, there are no guarantees that this feedback will be useful for the product development organization. In general, customer needs are difficult to identify and capture with a great deal of fidelity (O'Hern & Rindfleisch, 2010). For example, customers could demand a new feature that already exists but is unknown to the customers. Customer feedback can be particularly difficult to analyse since it frequently lacks the contextual cues that are used to understand the specific and unique nature of feedback (Dellarocas, 2003). Contextual cues can also vary between countries, thus further complicating the customer feedback collection process depending on which part of the world the feedback is coming from (Garrett et al., 2006). Without these contextual cues, it can be difficult to determine with certainty how skilled or knowledgeable a customer is with using a particular product. Therefore, a customer's lack of

satisfaction with a product could be simply due to their lack of technical know-how or familiarity with the product. Interestingly, this finding could actually speak to the usability of the product and perhaps the clarity of the product documentation, thus still indirectly providing useful feedback for the product development organization.

Third, and perhaps the most basic barrier is that not all customers have the same set of features and specifications that they desire in a product. Products that are extremely liked and well rated by some customers may generate a negative opinion by others. Furthermore, some customers might not desire changes in products that they use since this would require them to change the ways in which they use their products (Gassmann et al., 2010). Finally, attempting to understand and satisfy the individual, “market of one” needs of customers is an extremely expensive proposition (Thompke & Von Hippel, 2002). This last comment, in particular, is related to a phenomenon known as the “satisfaction trap” whereby organizations focus on improving the satisfaction of their most vocal customers, even though this group of customers composes only a small proportion of the overall customer base (Reichheld, 1996). One potential solution to this problem is for product development organizations to collect feedback that assesses multiple criteria (Jannach, Zanker, & Fuchs, 2014). Multi-dimensional product feedback allows product development organizations to determine whether a product is very frequently scoring low on a particular criterion despite variations in other criteria. Further, organizations should sort customer feedback into general feedback that has broad implications for most customers and more specific feedback that only applies to a fraction of the entire customer base.

UOPF Specific Barriers to Customer Feedback Integration

As they did with the benefits of online knowledge (feedback) integration, Füller et al. (2006) have summarized many of the most frequently cited barriers with integrating customer knowledge from online sources, the most critical of which are summarized below. One barrier that is very specific to UOPF stems from one of its greatest strengths: The anonymous and low-investment nature of UOPF increases the likelihood that feedback will be manipulated by either the product development organization itself (unrealistically positive feedback) or their competitors (unjustifiably negative feedback) (Johnson & Kaye, 2002). The anonymous nature of UOPF also creates difficulties with verifying the authenticity of feedback. For example, online feedback appearing to be originating from multiple individuals could in actuality have been provided by a single person in what is termed as “sockpuppeting” (Lim, Nguyen, Jindal, Liu, & Lauw, 2010). To further complicate matters, there is always a chance that the same customers have written feedback across multiple websites and online communities. While it could be possible to identify feedback originating from the same customers using the same username, sentence structure, Internet address, or unusual reviews, this approach is not fool-proof (Lim et al., 2010). In more extreme cases, negative UOPF could be of malicious intent if it was posted by a competitor in order to drive away customers from a particular competing product or brand. Lankes (2008) provides an excellent discussion of multiple unethical behaviours that organizations can engage in online. For example, “buzz marketing” encourages customers to provide highly positive feedback in return for various rewards. Similarly, “astroturfing” involves paid members of an organization who actively promote and defend their organization while posing as ordinary online users.

Fortunately, despite the above-mentioned potential for unethical uses of UOPF, Malbon also explained that there is a growing social and political movement that aims to regulate the unethical manipulation of UOPF by organizations through various types of “online reputation management” such as buzz marketing and astroturfing. For example, in December 2009, the US Federal Trade Commission instituted guidelines covering online testimonials and endorsements (Malbon, 2013). Similarly, Canada’s Commission Bureau fined Bell for \$1.25 million in 2015 for creating fake positive reviews of its own app (“Bell fined \$1.25 million for planting glowing online reviews of phone apps,” 2015). The impact of this barrier is also becoming diminished through the use of verification tools such as registered accounts. Amazon product listings clearly identify which product reviews are originating from verified accounts (customers) that have actually bought the product in question. This verification process assures prospective buyers and product development organizations that the posted product reviews are more likely based on actual product usage and not on less objective experiences such as that of general dissatisfaction with a brand. Amazon took additional steps to protect the integrity of online product reviews when it sued the creators of fake product reviews, including its own sellers that bought fake reviews, in hopes of maintaining its reputation for transparency (“Amazon Wants to Kill Fake Product Reviews,” 2016). Finally, large organizations might refrain from creating fake UOPF since the discovery of such underhanded methods would be seen as a public relations problem. Overall, these measures for reducing the manipulative use of UOPF appear to have merit since, despite the barriers mentioned above, findings indicate that approximately 70% out of 25,000 polled Internet customers trusted customer online reviews (Malbon, 2013). Furthermore, recent literature has found that online product reviews are ultimately more trustworthy than the

traditional sources of feedback despite the limitations discussed in this subsection (Kusumasondjaja et al., 2012).

Second, in the case of UOPF that is collected and stored externally to product development organizations' own websites, there is always the potential for the UOPF hosting sites to change the type of feedback collected or even to remove the feedback entirely with no prior notice. Hosting sites could even decide to prevent certain feedback from appearing on their websites or services if they determine that particular feedback does not meet the host's criteria for being posted publicly. The variety of approaches to how UOPF is organized and presented can also cause problems with collecting, aggregating and comparing UOPF found on different websites and online communities (Dellarocas, 2003). As a result, product development organizations are at the mercy of UOPF hosting sites as to what UOPF can be obtained, in what format, and for how long. Dahan and Hauser (2002) also point to the fact the customers themselves could choose to withdraw their feedback at any time; although the author did not state how many websites or online services allow their customers to do so. With respect to UOPF, this could happen if a customer chose to have their feedback deleted from an online website. This dependency on an external party is most significantly an issue for long-term, longitudinal analysis of customer feedback. However, product development organizations can minimize the impact of this pitfall by collecting and storing feedback from multiple online sources, thus ensuring that they are not overly reliant on a single source of UOPF. This suggestion also ensures that the UOPF is collected from a range of customers since different sources of UOPF appeal to some customer groups more than other (Xiang & Gretzel, 2010). Fortunately, Litvin et al. (2008, p. 14) state that although customer feedback that is stored on third-party websites has issues that need to be

considered, it still “convey[s] a sense of customer satisfaction level in a more neutral environment [than] can the company-sponsored sites”.

UOPF, due to its easily accessible and readily available nature, can also be obtained and used by product development organizations’ competitors, thus eliminating the relative competitive advantages of knowledge that is contained within customer feedback (Marsh & Stock, 2006). The ability to extract and integrate the knowledge effectively, however, is still seen as a significant and inimitable competitive advantage since customer feedback as a resource is of limited use if it is not analysed and integrated properly (Nambisan & Sawhney, 2011). Kohli and Jaworski (1990, p. 6) speak to this very point in their seminal article when they state that “Organisations differ in the extent to which they generate market intelligence, disseminate it internally, and take action based on intelligence”. Moran and Ghoshal (1999, p. 409) further note that “It is not the resources *per se*, but the ability to access, deploy, exchange, and combine them that lies at the heart of value creation”. This same principle applies to many other competencies that are simple to comprehend conceptually, but difficult to implement in practice. Table 3 summarizes the various customer feedback integration barriers discussed in Subsection 2.2.5.

Table 3: Summary of barriers to customer feedback integration.

Feedback Type	Description of Barrier	Source
General	Customers often cannot envision their future product needs	Von Hippel, 1986; Gassmann et al., 2010; Lin and Huang, 2012
	Difficulty in consolidating diverging customer product requirements	O'Hern and Rindfleisch, 2010; Thompke and Von Hippel, 2002
	Difficulty in monitoring and aggregating feedback from multiple sources	Dellarocas, 2003
	Customers have personal motivations for providing feedback	Gassmann et al., 2010
UOPF Specific	Anonymous nature of online feedback could lead to high levels of manipulation	Johnson and Kaye, 2002; Füller et al., 2006; Lankes, 2008; Lim et al., 2010
	Online feedback lacks the contextual cues required to set the context	Dellarocas, 2003; Garrett, Buisson, and Yap, 2006
	Possible dependency on a third-party to host customer feedback	Dahan and Hauser, 2002
	Competitors have access to the same customer feedback	Marsh and Stock, 2006

2.3 Unsolicited Online Product Feedback Typology

The previous subsections discussed the role of customer feedback in product development. However, there was little specific explanation of how UOPF differs from the traditional types of customer feedback. The following subsections explain why UOPF is specifically labelled as “unsolicited” and “online”. First, Subsection 2.3.1 explains the differences between the traditional and online feedback. Next, Subsection 2.3.2 describes the differences between solicited and unsolicited feedback. These subsections also explain the advantages and disadvantages of each type of feedback. Subsection 2.3.3 details the specific sources of UOPF. Finally, Subsection 2.3.4 summarizes the customer feedback typology.

2.3.1 Traditional Versus Online Feedback

Customer feedback can first be characterized based on whether it is obtained from offline (traditional) or online sources of feedback. To begin, the oldest and most direct form of customer feedback would surely be that of customers directly presenting their concerns to the business owners (Bragge & Merisalo-Rantanen, 2002; Gorry & Westbrook, 2011). Since customers dealt directly with the individuals in charge, changes to products or services were implemented very quickly if the owners saw business sense to do so. While customers have largely lost the ability to contact owners or senior managers of organizations directly, organizations have employed other traditional means to collect customer feedback. For example, comment cards are an example of a frequently used tool for customers to share their opinions with a business. The benefit of comment cards is that they are relatively inexpensive to administer and can be completed by customers with minimal supervision. Unfortunately, comment cards suffer from a

significant self-selection bias since it is mainly the very satisfied or very unsatisfied customers that provide feedback. Comment cards also have a limited probing ability if they do not contain open-ended questions or if customers do not provide contact information for possible follow-up contact. Feedback collection that is done using paper or telephone surveys or focus groups eliminates some of these barriers, but is also relatively expensive and time-consuming (Bryman & Bell, 2011; Tashakkori & Teddlie, 2010). Moreover, surveys and focus groups tend to collect customer feedback at very specific points of time thus preventing the identification of long-term changes in customer views and preferences. One universal limitation of the traditional feedback collection methods is that they are limited in their ability to collect responses from a very wide number of responders. Due to the general familiarity of academics with traditional feedback sources, they will not be examined in further detail other than stating that it is apparent that traditional sources of product feedback have inherent limitations that render them inadequate in providing a broad range of customer opinions (Wirtz & Tomlin, 2000). Unfortunately, most of the prior research on the role of customer feedback in product development focused on these traditional sources of product feedback.

The Internet has led to the conversion of traditional sources of feedback into an online form in order to address the previously stated limitations. For example, although comment cards were initially provided to customers in a paper copy, research on the use of online comment cards began nearly 20 years ago (Sampson, 1998). Similarly, feedback that is sent electronically via email has replaced letter mail (Opoku, 2006). Research on the use of online feedback sources was spurred by the growth of the Internet that allowed customers to go online and express their views (Opoku, 2006; Sampson, 1998). This argument is not surprising given that an ever-

increasing number of customers is choosing online websites and services as the preferred method to share their opinions of products. Most recently, as the Internet matured in the mid-2000s, the emergence of the participative, or “Web 2.0”, services enabled a large number of customers to provide product feedback to product development organizations (O’Reilly, 2007). Not surprisingly, Forrest and Cao (2010) findings show that almost 80% of Fortune 100 companies connect with their customers using at least one type of social media. These findings indicate that the amount of customer feedback that is found online is poised to exceed that of the feedback that is collected directly by product development organizations using traditional sources.

Füller et al. (2006, p. 58) summarize the benefits of obtaining feedback online instead of through traditional sources, including “multi-media richness, global accessibility, and low costs of communication and information processing facilities”. The first benefit is that online feedback lends itself to a detailed analysis by the product development organizations, which can then be used to develop better products (Barton, 2006; Harrison-Walker, 2001). In fact, an entire branch of product development research is focusing on automating and improving models for using online product reviews as a source of feedback for product development (S. W. Hong, Han, & Kim, 2008). Recent research has also attempted to understand better the exact nature of the information contained within online product reviews (Jannach et al., 2014). This stream of research focuses on automating the process through which useful knowledge can be extracted from the vast body of customer feedback contained within the online product reviews (Sun, Wu, Liang, & Liu, 2013). Research has also demonstrated that the entire process for identifying the reasons for positive and negative feedback could be automated, thus increasing the efficiency with which the feedback can be collected, analysed, and incorporated into new products (Dahan

& Hauser, 2002; Kim & Hovy, 2006; Sampson, 1998). In this case, organizations can respond to most negative feedback first and even monitor for changes in customer feedback over time, thus minimising the potential for negative feedback to affect the buying intentions of customers (Blazevic & Lievens, 2008). As of 2015, hundreds of social analytic tools and services, such as intelliseek.com and netbase.com, are available to researchers and businesses to collect data on specific products (Carr et al., 2015). Other tools exist to allow organizations to conduct their own data analysis including SPSS Modeler and NVivo (He & Yan, 2014). Finally, the highly measurable nature of online feedback can even be used as proof for senior management that existing products are not meeting customer expectations. Given that senior management support for customer feedback integration initiatives is crucial, the ability to collect objective proof of feedback integration benefits is highly valuable in having the initiatives continue (Jaworski & Kohli, 1996).

Note that although this section directly compares traditional and online feedback, it is not necessary for product development organizations to only focus on one type of feedback. In fact, researchers have suggested that the two approaches can be complementary. Carr et al. (2015) suggest that traditional feedback is still preferable in developing countries where the use of social media has not penetrated through the general customer population as it has in North America, Europe and Australia. Carr et al. have also suggested that online social media research could first be used to generate a vast amount of insight and then traditional research methods, such as focus groups, could be used to obtain more specific and detailed insight.

2.3.2 Solicited Versus Unsolicited Feedback

Customer feedback can also be classified as solicited or unsolicited feedback depending on who initiates the creation of feedback (Sampson, 1996). Floh and Treiblmaier (2006) describe these two possibilities for communication between customers and companies as being either company-controlled or customer-controlled, respectively. To begin, solicited feedback consists of actively and passively solicited feedback that product development organizations solicit themselves. Actively solicited feedback is initiated directly by product development organizations for the purpose of targeting a specific customer group. For example, organizations that solicit feedback via telephone surveys and focus groups are collecting actively solicited feedback since the organizations themselves must initiate the feedback collection process and encourage their customers to provide feedback. The benefit of active feedback solicitation is that organizations can expend their resources actively to reach specific customer segments that might not proactively provide feedback. Once customers agree to provide feedback, organizations can attempt to convince a small group of customers to provide feedback on an ongoing basis. Unfortunately, active feedback solicitation methods are often expensive and are only conducted periodically, thus providing a snapshot of customer perceptions at very specific points of time (Sampson, 1998).

Passively solicited feedback collection is also initiated and controlled by the product development organizations, except that they are not targeting specific customer segments. Comment cards and emails are examples of passively solicited feedback since product development organizations distribute the comment cards or provide an email address point-of-contact, but do not actively solicit the customers to provide feedback. Although passively

solicited feedback is less expensive to administer than actively solicited feedback, it is more prone to self-selection bias. Self-selection bias occurs because customers that provide passively solicited feedback tend to be those customers with either very positive or negative feedback. This bias reduces the collection of feedback from those customers that might not have very strong opinions but constitute the largest proportion of customers. More significantly, self-selection bias decreases the generalizability that can be obtained (Sampson, 1996, 1998). Finally, it is difficult to obtain longitudinal responses from the same customers since securing a long-term commitment is difficult.

Compared to solicited feedback, unsolicited customer feedback is any type of feedback that is initiated directly by the customer (Sampson, 1998; Wirtz, Kuan Tambyah, & Mattila, 2010; Wirtz & Tomlin, 2000). Similarly, Duncan (2005) states that in customer-initiated communication, a customer is the transmitter or initiator of communication and the organization is the receiver. Examples of unsolicited feedback include customers complaining directly and in-person to retailers, sending letter mail or emails to product development organizations that did not request the feedback themselves, or more recently, expressing their concerns online. The key benefit of unsolicited feedback is that customers themselves initiate and control the feedback process, thus lowering the search costs involved in soliciting customer feedback (Bragge & Merisalo-Rantanen, 2002). Unsolicited feedback is also generated on a constant basis hence providing for an easier assessment of the long-term changes in customer perceptions (Sampson, 1996). Unfortunately, like the passively solicited feedback, unsolicited feedback also suffers from large self-selection bias (Finch, 1999). Furthermore, since product development organizations do not solicit this type of feedback themselves, the feedback is dispersed across

numerous publicly accessible websites which complicates the collection and aggregation of feedback (Cho et al., 2002). Table 4, which has been adapted from Sampson 1996, summarizes the key differences between solicited and unsolicited feedback (Sampson, 1996).

Table 4: Comparison of solicited and unsolicited feedback.

Criterion	Actively Solicited Feedback	Passively Solicited Feedback	Unsolicited Feedback
Sampling	Controlled by Researcher	Controlled by Researcher	Controlled by Respondent
Expected Response Rates	High	Low	Low
Expected Response Bias	Low	High	High
Feedback Collection Time Frame	Discrete Studies	Continuous Collection	Continuous Collection
Relative Cost	High	Low	Low

UOPF, which is found online within virtual community posts, social network posts, blogs/vlogs and online product reviews, will be assumed to be a form of unsolicited customer feedback since it is predominantly the customers that initiate the feedback process. Interestingly, Finch (1999) discussed the existence of third-party solicited feedback that would be initiated by websites or services that store online feedback. This finding holds true even today given that many online retailers are actively requesting online feedback, as is shown in Appendices C and D. Finally, while product development organizations can develop and host the websites or online communities for customers to provide the feedback, the present study assumes that this is a type of passively solicited feedback since the product development organizations are soliciting the feedback themselves.

2.3.3 Sources of Unsolicited Online Product Feedback

Social media came to prominence with the development of Web 2.0 that allowed Internet users to both read and create web content (O'Reilly, 2007). Web 2.0, or participative web, led to the rise of highly popular services in the mid-2000s such as online forums, Facebook, YouTube, blogs and Twitter. More significantly, Web 2.0 changed business dynamics by allowing individuals to have a voice that could be seen by millions of geographically dispersed individuals around the world. Web 2.0 streamlined and simplified the ability for the average individual to be both a customer and creator of knowledge (O'Reilly, 2007). Carr et al. (2015) further explain that social media are “an array of platforms that allow people to interact, create, share, and/or exchange information and issues in virtual communities and networks.” Similarly, Kietzmann et al. (2011, p. 241) state that social media allow “customers to utilize platforms - such as content sharing sites, blogs, social networking, and wikis – to create, modify, share and discuss Internet content.” Most importantly, social media allow individuals to work together to create a large amount of content referred to as “collective intelligence” (Bonabeau, 2009), customer-generated media (Kusumasondjaja et al., 2012) or customer-generated content (Xiang & Gretzel, 2010).

Unfortunately, since very little prior work has been done to create a definitive typology of online social media, the present study will focus on the most frequently used sources of social media (Leenders & Dolfsma, 2016; Xiang & Gretzel, 2010). The four primary sources or “channels” of social media that contain UOPF consist of virtual community posts, online product reviews, social networks posts, and blogs/vlogs (Lee & Yang, 2015). These sources of UOPF are all considered as subsets of social media, but have never been investigated within a single

study in terms of their impact on product development (Piller et al., 2012). The remainder of this section examines each of these sources of UOPF in greater detail. The sources are organized with respect to the amount of prior literature that has examined the role that these sources play in providing feedback for product development. Not surprisingly, older sources of social media, such as virtual customer communities, have received the greatest attention.

Virtual Customer Communities

One of the first moves into harnessing the power of the Internet for developing new and improved products came in the form of virtual customer communities (Holstroem, 2001; Nambisan, 2002; Prahalad & Ramaswamy, 2000). Armstrong and Hagel (1996) first discussed the potential of virtual communities for business in the mid-1990s. The authors saw online communities, and the Internet for that matter, as a rich medium for customer communication that was not yet explored or exploited in the business environment. The authors also provided a good discussion of the various types of communities as well as some best practices for developing and managing successful virtual communities. Similarly, Finch (1999) examined the role of Internet discussions as a rich source of information for product development. Finch's study also provided an early look into the potential of the Internet for product development, despite focusing on the now largely defunct newsgroups. Unfortunately, both of these papers were ahead of their time given that Internet was still gaining momentum as a legitimate source of business-to-customer and customer-to-customer transactions. Although new services and technologies have since superseded the ones listed in these papers, the original idea behind the development of these virtual communities was that they would serve as centralized places where

highly interested, skilled and tech-savvy customers would gather to share their opinions and suggestions for improving both current and future products.

Füller et al. (2006) are among the few authors who distinctly mentioned the possibility of using virtual customer communities as a source of ideas for product improvement, as well as for completely new products. Similarly, Kim, Bae, and Kang (2008) investigated the role of online brand communities in generating useful feedback for product development. More specifically, the idea of “community-based innovation” was formally examined by Füller et al. (2006) who wanted to provide practical suggestions for how community members could be integrated into the innovation process. Initially, virtual customer or “brand” communities were created by leading product development organizations, such as Audi, Ducati, Nike and Harley-Davidson, in hopes of establishing closed networks where customers would share ideas, collaborate, and ultimately provide concrete suggestions for product development organizations that hosted the virtual community (Füller et al., 2008; Nambisan, 2002). One limitation of Füller et al. (2006, p. 58) study is that it focused on accessing the innovative capabilities of virtual community members, hence the authors were primarily focused on actively acquiring feedback from virtual communities consisting of “desirable” members, such as “inventors, lead users, designers, engineers, ..., or heavy users.” Unfortunately, focusing on specific groups of customers greatly limited the portion of the entire customer base that could participate and would actively become involved in product development. This focus on highly skilled customers provides an opening addressed in the present research study by examining the impact of integrating the average customers’ feedback into product development. As the authors themselves acknowledged, different types of customers can provide different types of feedback for product development.

Research on community-based innovation has also been limited since it largely focused on the psycho-social group dynamics or managerial aspects of managing these online communities (Chu & Chan, 2009; Hennig-Thurau et al., 2004; Puaah, Bakar, & Ching, 2011). Consequently, the present study addresses the call by previous research to examine the direct implications of virtual community feedback on product development. Interestingly, although studies on virtual customer communities have first appeared in the mid-1990s, there appears to be no clear consensus on the definition of a virtual community. Porter (2004, p. 1) defined virtual communities as “an aggregation of individuals or business partners who interact around a shared interest, where the interaction is at least partially supported and/or mediated by technology and guided by some protocols or norms.” Furthermore, Porter discusses an interesting typology of virtual customer communities whereby communities are either member-initiated or organization sponsored. Porter also suggests that virtual communities can be categorized based on the general relationship orientation of the community. In this case, communities would primarily be associated with social or professional nature of interactions.

At present, virtual customer communities primarily exist in the form of online forums that can either be hosted on the product development organization’s website, their various resellers’ websites, or third-party websites. One example of such a community is iLounge.com which hosts a wide variety of discussion forums on Apple products and services, but is neither owned nor operated by Apple (Füller et al., 2008). Another popular example is Reddit.com that hosts a wide variety of discussions on topics from politics and art to consumer electronics. It is on these forums where the past and current customers provide feedback in the form of product reviews of products, discuss favourable and unfavourable product characteristics, and even discuss future

product ideas. Even though product development organizations have less control over open virtual communities, especially ones that they do not host themselves, they benefit from having a much larger number of active participants. Arguably, it is this ability of UOPF to attract a large number of participants from across the various customer segments that likely confers the greatest advantage over traditional sources of feedback. The free and open nature of most virtual communities also ensures that customers can provide a wide range of both positive and negative feedback for a particular product, thus capturing a much better representation of the overall customer opinion. The popularity of virtual communities is supported by Porter (2004) finding that 84% of Internet users have contacted or participated in a virtual community and that these figures are expected to increase. Large groups of customers have even started to form networks of knowledge and skilled individuals that could innovate better than product development organization's internal R&D departments (Tuomi, 2002).

Final discussion on virtual customer communities revolves around the fact that some online communities have a predominantly negative perspective of one or more organizations. For example, Harrison-Walker (2001) examined the impact of "e-complaining" found on online complaint forums. In this case, individuals form virtual communities to express their concerns and dissatisfaction with particular products and/or services. Although these communities are generally negative in nature, Harrison-Walker nonetheless argued that the complaints found on these forums can be used to develop better products and services. As Harrison-Walker further argued, it is impossible to ignore or block the creation of such virtual communities since new ones can be developed rapidly on the Internet (Harrison-Walker, 2001). Researchers have also found that many companies focused on pacifying or even silencing angry customers rather than

trying to resolve the actual sources of customer dissatisfaction in what is termed “defensive marketing” (Cho et al., 2002; Liu & Mattila, 2015). Unfortunately, as Harrison-Walker (2001) points out, companies that do not address online complaints risk having lower sales since they do not practice “offensive marketing” that seeks out new customers. Since these communities develop organically, it is up to organizations to support the communities through active participation rather than attempting to control them outright (Axelrod, 2006). Product development organizations can take immediate remedial action by responding to customer concerns online to demonstrate their willingness to take customer concerns into account. For example, organizations can employ “community managers” who are tasked with providing assistance to customers that are posting concerns online. By addressing customer concerns, community managers provide a potential remedy to irate customers while also creating a positive perception among other customers that are observing the online interaction between the upset customer and the community manager. Long-term remedial action, as is the focus of the present study, occurs through the development of better products and services that more directly address the customers’ concerns.

Online Product Reviews

Online product reviews are the second source of UOPF examined in this study (Mudambi & Schuff, 2010). The popularity of online product reviews grew following the rise of Internet use among the general population in industrialized countries in the mid-1990s (Sampson, 1998). The subsequent rise in online commerce (e-commerce) has further increased the prevalence and importance of this type of product feedback (Lee & Yang, 2015). Online product reviews allow online shoppers to share their opinions, thereby encouraging others to shop online. More

importantly, unlike traditional WOM, online product reviews provide a long-term account of customer feedback that not only allows product development organizations to track changes in their customers' satisfaction over time, but also remains as a persistent record for all prospective buyers (Dellarocas, Zhang, & Awad, 2007). In addition to retailers that directly sell products to customers, many websites act as repositories of customer product reviews that first attract visitors with product reviews and then forward these visitors to online retailers. One such example is CNet.com which provides expert product reviews and also provides a venue for regular customers to provide their own product reviews. In turn, CNet.com benefits from increased visitors, advertisement revenue, and through-sale referrals.

Some of the earliest examinations of the value of online product reviews investigated the ability of online movie reviews to predict movie sales (Dellarocas et al., 2007; Wang, Liu, & Fang, 2015). Currently, most websites that host movie reviews also provide direct links for users to purchase movie tickets and/or recorded media. A similar impact of reviews on book sales was observed by Friedman (2005, p. 94) who noted that "The geeks on Amazon.com are increasingly writing their own book reviews, echoing among the most important reviewers in the world, reducing the dominance of traditional icons like The New York Review of Books and The New York Times Book Review." In addition to the movie and book industries, the hospitality and tourism industry has also been shaped by the high popularity of online product reviews on a variety of websites that either directly sell vacation packages or forward users to other tourism e-commerce sites (Kusumasondjaja et al., 2012; Xiang & Gretzel, 2010). Even the food industry has been subject to investigations of how online customer feedback can be used to develop superior products (Carr et al., 2015). Nonetheless, prior research has primarily focused on

examining the "demand enhancing" impact of online product reviews on the purchasing intention of other buyers and the link between positive reviews and selling price and overall sales (Dellarocas, 2003; Li, Hitt, & Zhang, 2011). Lee and Yang (2015) also found that most prior research on online product reviews has focused on customer learning, purchasing behaviour, and marketing while little effort has been placed on examining how organizations integrate the information from online product reviews into product development. With respect to product development, the only identified, semi-relevant research study on this topic comes from Kumar et al. (2010) who state that positive or negative online product reviews can be used as general indicators of customer satisfaction with a product or service. However, as is typically the case with the extant research on online product reviews, the focus of Kumar et al. (2010) study was on assessing the impact of online product reviews on other customers and not as a means of improving product development success. The present study will bridge this gap in knowledge.

It is also important to state that the present study will focus on the online product reviews provided by regular customers rather than by professional reviewers. Although professional reviews have a great deal of influence on the purchasing habits of customers and also provide useful feedback, this paper focuses on the general customer reviews as they have not received attention in previous studies. Furthermore, professional reviews are often seen as less honest than regular customer reviews since customers feel that professional reviews are overly favourable to the sponsoring organizations so as not to be eliminated from future product reviews (Kusumasondjaja et al., 2012). Feedback obtained from the general customer population could, therefore, provide a less biased perception of products' true strengths and weaknesses.

Social Network Posts

Social network posts are a relatively more recent source of UOPF that has gained the interest of management researchers. Social networks can be defined as “web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others in the system” (Boyd & Ellison, 2007, p. 211). As is the case with research on virtual customer communities and online product reviews, social networks have also been a subject of research on the automated approaches for analysing customer sentiment for the purpose of knowledge collection (Hao et al., 2011). More recently, social network research has expanded beyond automated sentiment and content analysis to investigating the impact of social networks on customer purchase intentions.

In regard to the impact of social network posts on product development, there is overlap between the impact of social network and virtual community posts. This finding is not surprising given that both of these sources of UOPF involve online communities and are considered types of social media. Furthermore, both of these sources of UOPF have been examined using the netnographic research methodology (Piller et al., 2012; Zaglia, 2013). Netnography is a recent research method that employs the principles of ethnography, but studies group interactions in the online context (Bryman & Bell, 2011; Kozinets, 2010). The differences between these two sources of UOPF primarily arise in the type of medium that carries the feedback. Virtual community posts have mainly existed in the form of online forums, while social networks are situated on services such as YouTube, Facebook, and Twitter. Therefore, much of the discussion provided in the preceding subsection on virtual communities applies to other types of social

media such as social networks, except that there are nuances in terms of the medium that is hosting the feedback.

One specific benefit of social network posts as a source of feedback compared to virtual communities is that they connect individuals from very diverse socio-economic areas. This connectivity has ensured a tremendous amount of popularity of these websites. For example, between 2005 and 2016, Facebook has grown from 1 million to 1.6 billion active users (“Company Info | Facebook Newsroom,” 2016). This exceedingly large number of active users means that product feedback that is posted on social networks has the potential to be viewed by a very large and diverse group of current and future customers. In comparison, virtual customer communities tend to be composed of members with similar interests. Social networks thus lead to higher exposure and reach, but result in less overall specificity on a particular topic since participants have varying amounts of interest or expertise on specific topics (Boyd & Ellison, 2007; Zaglia, 2013). More significantly for product development organizations, social networks have generated a tremendous amount of data that could provide insights for product development. In fact, between 2010 and 2012, data generated through social networking services accounted for 90% of all data created in history (Piller et al., 2012). In summary, the important aspect of social network posts for the present study is the idea that discussion and sharing between customers can lead to knowledge that can be exploited by product development organizations. Moreover, social network posts related to products can have a large impact on the purchasing intentions of customers (Goodrich & De Mooij, 2014; Zeng et al., 2009).

Blogs and Vlogs

Finally, prior studies on the role of social media in product development have identified blogs as a source of customer feedback (Kietzmann et al., 2011; Xiang & Gretzel, 2010). The name blog was first popularized in the 1990s from words “web log” as first blogs were often used by individuals as electronic diaries or journals (Rosenberg, 2009). The most popular blogs today are primarily run by professional bloggers or by the large news, political, and government organizations. Blogs that are run by organizations can either be public or non-public, depending on whether the public can freely access the blog or not, respectively (Balagué & De Valck, 2013). Nevertheless, the majority of blogs are public as they are used as a means of interacting with customers.

More significantly for the present study, blogs are also operated by individuals that are not under the direct control of product development organizations. These non-professional bloggers provide regularly updated content on a variety of subject areas, including product reviews, likes and dislikes. In addition to text and picture-based blogs, a significant amount of individuals are using vlogs, or “video logs”, to create content. Most notable and popular video blogging service is YouTube. Although the content medium is different, there does not appear to be much difference between blogs and vlogs that are applicable to the present research study, hence they are classified as the same form of social media.

Another form of blogs is the so-called “micro-blogs”, of which Twitter is the most famous (Lambert & Vie, 2015). Twitter is termed a micro-blog because it is composed of short messages or “tweets” that have a maximum length of 140 characters, rather than longer posts. However,

this distinction is becoming increasingly blurred as Twitter has recently contemplated increasing the post length and even allowing users to post short video clips (Rosen & Ihara, 2017). Observe that Twitter was also named as an example of a social network, because it can technically be considered as both a network and micro-blog. Many of the other services named in this document can be considered as multiple types of social media as the distinction between the services becomes increasingly blurred.

Product feedback contained within the blog/vlog posts thus serves as yet another source of UOPF that can be exploited by product development organizations for the purpose of improving their product development process success. Information that is contained in the blogs or vlogs also generate a large amount of discussion in the comments, which provides an additional source of feedback for product development. Organizations appear to be aware of this possibility as some have assigned employees to monitor specific blogs or the entire “blogosphere” of blogs for useful information (Ho & Lee, 2015). However, these efforts have primarily been focused on monitoring customers’ opinions, rather than serving as sources of feedback for product development. Moreover, as is the case with other sources of social media, blogs have a proven direct and positive influence on relationship building and the purchasing habits of the individuals that visit and read the blogs (Ho & Lee, 2015).

2.3.4 Feedback Typology Summary

In summary, based on the discussion in the preceding subsections, customer feedback can be classified as either traditional or online depending on the medium where the feedback is created, stored, and collected. This same feedback can then be classified as either solicited or

unsolicited depending on how much involvement product development organizations have in soliciting the feedback. Table 5 presents a 2x2 table for this topology as well as examples of product feedback sources that would fit into each quadrant. The present study focuses on UOPF, found in the top-right quadrant in the table below, because this type of feedback has received the least amount of attention in prior research studies and especially so in relation to product development success.

Table 5: Product feedback typology with examples of feedback sources.

	Traditional	Online
Unsolicited	In-person feedback, letter mail or telephone calls initiated by customers themselves	Social media content generated by customers themselves
Solicited	In-person focus groups, paper and telephone surveys, and paper comment cards solicited by product development organizations	Electronic surveys, focus groups, comment cards, and emails solicited by product development organizations

2.4 Customer Feedback Integration

As was explained earlier, customer feedback is a source of valuable knowledge that can be integrated to improve product development success. The focus of this subsection is to formally develop the two primary constructs that have been used to examine how product development organizations collect and integrate customer feedback into their product development efforts. First, **customer orientation** construct explains the attitudes that product development organizations have about collecting and integrating customer feedback into product development. The second construct, **cross-functional integration**, explains how the customer

feedback is subsequently shared within the product development organization. Therefore, these two constructs comprise the complete route that product feedback follows from customers into the product development organization's marketing department and then ultimately to the R&D team that develop the products.

2.4.1 Customer Orientation

The primary idea discussed in the present study is that product knowledge can be transferred from customers to product development organizations. Kohli and Jaworski (1990) and Naiver and Slater (1990) concurrent studies are largely attributed with triggering research interest on the market orientation construct. For reference, the difference between marketing and marketing orientation is explained succinctly by Deng and Dart (1994) who state that marketing as a construct is the business philosophy of achieving success by focusing on satisfying market needs, while marketing "orientation" is the practical implementation of the marketing construct. Specifically, marketing orientation involves gathering, disseminating, and responding to market intelligence (Kohli & Jaworski, 1990). In their subsequent study, Jaworski and Kohli (1996) investigated the impact of market orientation on an organizations' ability to act on internal and external market information. Homburg and Pflesser (2000) extended the discussion by examining the relationship between marketing orientation and organizational performance. Finally, Brown and Eisenhardt (1997) examined market orientation from a strategic perspective by investigating how product development organizations can utilize customer (market) feedback as part of their product strategy. More directly related to the topic of the present study, multiple authors examined the specific impact of market orientation on the product development performance, rather than on the more general organizational performance as was done by

previous researchers (Atuahene-Gima et al., 2005; Kahn, 2001; Kahn, Barczak, Nicholas, Ledwith, & Perks, 2012).

Nonetheless, in each of the above studies, apart from the expected differences in research methodologies and theoretical underpinnings, higher levels of interaction between product development organizations and their customers resulted in higher levels of product development driven organizational performance (Kirca et al., 2005; Narver & Slater, 1990). Although several frameworks have been proposed and tested over the years to explain the relationships between the constructs related to market orientation, most of these still follow the framework proposed by Jaworski and Kohli (1993); shown in Figure 4. In their framework, Jaworski and Kohli investigated both the antecedents and consequences of market orientation. For example, market orientation was driven by top management support, interdepartmental dynamics (conflict and connectedness), and organizational systems which reward market-oriented behaviour. It should be noted that although market orientation can be driven by both internal and external factors, most prior studies have focused on the internal factors since product development organizations can directly control these (Jaworski & Kohli, 1993; Lusch & Laczniak, 1987).

At approximately the same time, while Kohli and Jaworski (1990) focused on the broader market orientation construct, Narver and Slater (1990) saw **customer orientation** as one of the three distinct components of market orientation; the other two being cross-functional integration and competitor orientation. Deshpandé, Farley, and Webster (1993) define customer orientation as, “the set of beliefs that puts the customer's interest first, while not excluding those of all other stakeholders such as owners, managers, and employees, in order to develop a long-term

profitable enterprise. Brady and Cronin (2001) define customer orientation succinctly as the “firm’s ability to satisfy customer needs adequately”. For the purpose of the present study, customer orientation can be simply defined as “the creation of a customer-oriented culture aimed at bringing exceptional value to customers by continuously understanding and satisfying their needs” (Wong & Tong, 2011, p. 36). Although customer orientation as a construct is more focused than market orientation, one deficiency in the prior literature is that significant overlap occurs between the market orientation and customer orientation constructs. Based on an investigation of the measures of market orientation used, it is apparent that most prior studies used measures of customer orientation under the umbrella construct of market orientation (Deshpandé et al., 1993). Jaworski and Kohli (1996) noted the presence of four distinct definitions of market orientation, which further supports the notion that different researchers interpreted customer orientation to refer to the linkage between external customer needs and the internal product development process.

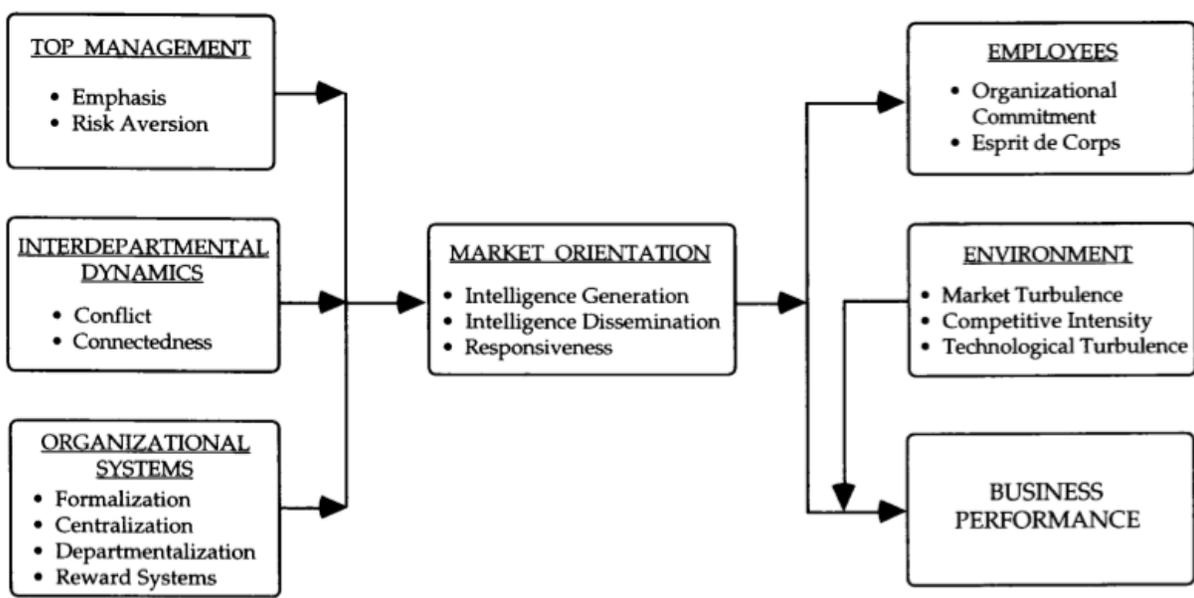


Figure 4: Jaworki and Kohli (1993) model of market orientation.

More recent studies have investigated in greater detail the relationship between customer orientation and product development success with the inclusion of additional moderating and mediating factors such as product vision (Tessarolo, 2007) (shown in Appendix A), corporate culture (Deshpandé et al., 1993), learning orientation (Baker & Sinkula, 1999) (shown in Appendix B), and product innovativeness (Kirca et al., 2005) (shown in Figure 5). Most notably, Kirca et al. (2005) expanded on the prior frameworks of Jaworski and Kohli (1993) with a more inclusive framework, shown in Figure 5, that includes additional consequences of market orientation such as the impact product innovation and product development success (quality and customer satisfaction). Kirca et al. (2005) findings position product innovativeness and product success as drivers of organizational performance. Moreover, market orientation appears to have the most pronounced positive effect on product development process (innovation) success rather than on customer satisfaction. These findings are extremely useful for the present study since they directly support the relationship between customer orientation, product development process success and product success. Product development success ultimately leads to financial and organizational success which has already been investigated and confirmed in prior research (Baker & Sinkula, 1999; Swink & Song, 2007). However, the present study did not consider the long-term financial or organizational success factors due to difficulties in obtaining this information with an anonymous survey.

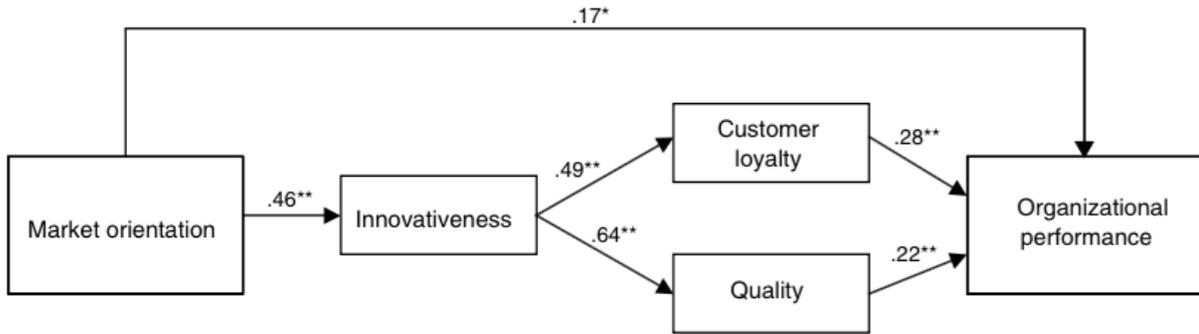


Figure 5: Kirca et al. (2005) impact of market orientation on organizational performance.

Findings discussed here are not surprising given that knowledge, as is predicted by the knowledge-based theory, has already been identified as a very valuable resource for product development. Consequently, organizational behaviours that improve the communication and knowledge transfer from customers to product development organizations are bound to have a positive impact on product development success. In the case of the present study, knowledge is found within UOPF that contains valuable insight into the potential improvements for existing products and for the development of more innovative products. This definition will also help to frame the specific investigation conducted in the present study since this study does not address the competitor orientation dimension of market orientation, as was proposed by Narver and Slater (Narver & Slater, 1990). Fortunately, this omission will not affect the validity of the present study since prior studies have reported mixed results on whether competitor orientation has an effect on product development success (Wong & Tong, 2011).

Finally, it is important to reiterate that conflicting findings exist on the impact of high level of customer participation and innovativeness. Specifically, Lin and Huang (2012) found that high levels of customer participation could negatively impact innovativeness. This finding

supports Von Hippel (1986) contention that “listening” to customers is not always a wise business decision, as customers cannot provide feedback for innovative products that they have not already used. Nonetheless, Lin and Huang found a positive impact of customer participation on the effectiveness and efficiency of the product development process, even if a positive impact on innovation was not observed. Similarly, although Kirca et al. (2005) initially found a slightly negative relationship between market orientation and organizational success, their follow-up meta-analysis did ultimately find a significant positive relationship between the two constructs. Since the present study does not focus specifically on the development of radically new products, conflicting findings in the literature on the impact of customer orientation for innovation are more pertinent to future research on the boundary conditions of the findings presented in the present study. Moreover, recent research is moving away from this dichotomous perspective of innovation as it is increasingly difficult to determine the exact level of innovation that is occurring in complex products (Cuevas-Rodríguez et al., 2013).

2.4.2 Cross-Functional Integration

Cross-functional integration construct in the present study focuses on the flow and sharing of knowledge within an organization. As was the case with customer orientation, Narver and Slater (1990) perceived cross-functional integration as the second of three elements of marketing orientation. It is important to mention at the start of this discussion the varying terminology used for this construct. One of the most frequently used terms is that of “interfunctional or interdepartmental integration” (Kahn, 1996, 2001). Fundin and Bergman (2003) referred to a similar construct under the term cross-functional connectedness, where they focused on the communication between different functions within organizations. Cross-functional integration

(Harmancioglu et al., 2007; Olson et al., 2001; Sherman, Berkowitz, & Souder, 2005) and functional cooperation (Brown & Eisenhardt, 1995; Griffin & Hauser, 1996; Song & Parry, 1992) are other nomenclatures that have gained frequent use in the literature. Next, as an ode to the linked nature of cross-functional integration and market orientation, Jaworski and Kohli (1996) discussed the construct of market information processing, which based on the authors' descriptions, is more analogous to cross-functional integration than market orientation. Some researchers referred to this construct as simply internal communication, which is actually a very apt name for a construct that, at its most fundamental, deals with communication for the purpose of sharing knowledge between different groups within an organization (Cooper, 1979; Homburg & Pflesser, 2000). Ultimately, **cross-functional integration** is the nomenclature chosen for the present study since it encompasses the entire range of communication and collaboration activities that are required for knowledge to flow effectively within an organization. This is also the nomenclature used in the more contemporary research papers (Troy et al., 2008).

In contrast to the studies which perceived cross-functional integration as a single dimension focused on communication, Kahn (1996) built upon the ideas presented in Lawrence and Lorch's (1967) seminal work by splitting the construct into interaction (communication) and collaboration dimensions. Although numerous other researchers have also argued for a multi-dimensional nature of cross-functional integration, Kahn's study incorporated and improved upon the ideas presented in previous research, thus minimising the need to discuss the additional studies in detail (Dyer, Gupta, & Wilemon, 1999; Ashok Gupta, Raj, & Wilemon, 1986; Kahn, 1996; Souder, 1988). To summarize, Kahn's contribution is important since it combined the previous research, which saw cross-functional integration as solely related to interaction

(communication), and research that focused on team-based aspects of cross-functional work (collaboration). In general, activities that promote communication between different functions or departments include routine meetings, planned conference calls and the flow of various documents. In comparison, collaboration was demonstrated through shared resources, processes, and goals. This finding was supported by previous research, which found that cross-functional sharing of resources and organizational coordination were important for product development (Olson, Walker Jr, & Ruekert, 1995). Interestingly, Kahn (1996) found that interaction was also important, but not a sufficient driver of product development success. Instead, it was collaboration that had a much more significant positive impact on product development success. Organizations that exhibit practices which encourage interaction, and more importantly collaboration, achieve higher levels of cross-functional integration that ultimately results in higher levels of product development success. For example, organizations can develop collaboration by encouraging employees to work in different functions in order to share their experiences and culture, thus blurring the line between different functions (Griffin & Hauser, 1996).

Overall, prior research has found a positive link between cross-functional integration, specifically marketing and R&D integration, and product development process success (Griffin & Hauser, 1996; Ashok Gupta et al., 1986; Jassawalla & Sashittal, 1998; Kahn, 1996, 2001). Effective integration between cross-functional teams can even be attributed to improved product quality, which then leads to products that can better satisfy customer demands (Sethi, 2000). Cross-functional integration was particularly important in industries with high levels of uncertainty such as product development in the consumer electronics industry (Gupta &

Govindarajan, 1991). Furthermore, there is a clear need for effective collaboration for the purpose of achieving mutual, superordinate goals in order to achieve product development success (Olson et al., 1995). Not surprisingly, increased focus on cross-functional integration differs from the earlier management perspectives that perceived functional units as distinct and separately managed entities (Kotler, Rackham, & Krishnaswamy, 2006).

The positive impact of cross-functional integration on product development process success can be explained by noting that cross-functional teams exhibit richer communication, schedule performance, clearer line-of-sight to customers, greater idea exchange and flow of information, and “speedy” time to market (Dewar & Dutton, 1986; Keller, 2001; Olson et al., 2001; Wren, Souder, & Berkowitz, 2000). This positive impact allows different “departments to bring their knowledge and expertise together for the purpose of better satisfying customer needs at lower costs and better quality, with greater efficiency” (Wong & Tong, 2011, p. 35). More importantly, information that is obtained and shared by different functions within an organization was found to be of higher quality (McQuarrie & McIntyre, 1992) and higher in the diversity of ideas (Sethi et al., 2001) than would be generated by each function alone. Finally, cross-functional feedback sharing leads to a common understanding of problems within the different parts of the organizations, thus leading to more effective product development (Marsh & Stock, 2006) and more innovative solutions to problems (P. Hong et al., 2004, p. 148).

As was the case with the discussions of customer orientation, it is important to clarify that cross-functional integration has its own set of barriers that can have a negative impact on product development organizations. Without understanding the potential barriers to knowledge flow

within organizations, it is possible to underestimate the impact of UOPF as a source of customer feedback since the feedback will not have a positive impact on product development success if it does not reach the product R&D teams. Many of these barriers become apparent only as the various functions grow, thus becoming increasingly more specialized and distinct, which has a negative effect on communication and collaboration between the functions (Griffin & Hauser, 1996). In particular, cross-functional integration can lead to delays in product development projects due to increased time and cost required to align the goals, orientations, and timelines of all the functions (Homburg & Jensen, 2007; Lawrence & Lorsch, 1967; Swink & Song, 2007). Furthermore, Keller (2001) summarizes several prior studies that examined the possible, negative aspects of cross-functional integration. For example, cross-functional teams tend to exhibit lower levels of group cohesiveness and job satisfaction and higher levels of job stressors and turnover rates. Harmanciouglu et al. (2007) and Swink (2000) also state that cross-functional integration can lead to stress, confusion, and endless discussions. This is not an unexpected finding given that different functions recruit individuals with different backgrounds and develop internal cultures with unique interests, rituals, and terminologies (Griffin & Hauser, 1996). Ultimately, these barriers necessitate that product development organizations manage their cross-functional integration efforts carefully and continuously so that they produce the intended results.

In summary, based on the discussion provided in subsections 2.4.1 and 2.4.2, both customer orientation and cross-functional integration constructs are considered in the present study given that both are necessary for product development success (Olson et al., 2001). This approach is similar to some prior studies that accounted for both of these constructs in order to

measure the flow of information into and throughout the organization (Harmancioglu et al., 2007; Tassarolo, 2007). Furthermore, organizations that exhibit high levels of customer orientation and cross-functional integration are said to exemplify the principles of a learning organization: being guided by a vision of solid understanding of the market that is shared throughout the organization (Slater & Narver, 1995). The present study first re-examined the impact of customer orientation and cross-functional integration on product development success, but in the consumer electronics industry that has not received substantial prior investigation. Second, unlike what has been done in prior studies, the present study investigated whether customer orientation and cross-functional integration impact on both the process and product success dimensions of product development success.

2.4.3 Organizational and Strategic Considerations

Organizational and strategic level considerations to customer feedback integration also need to be discussed. Joshi and Sharma (2004) provide a good discussion of the key issues that prevent a greater number of organizations from utilising customer feedback more frequently and effectively. Although the present study focuses on UOPF, the considerations mentioned in this subsection are general enough to apply to multiple types of customer feedback and are thus worthy of discussion. First, the ability to analyse and integrate customer feedback requires an investment of resources and skills that product development organizations might neither possess nor see as a worthwhile investment. Marsh and Stock (2006) refer to this constraint in the ability to assimilate knowledge as the “absorptive capacity” of an organization, as was first described by Cohen and Levinthal (1990). Absorptive capacity is directly important for product development because organizations with higher levels of absorptive capacity are more

innovative since they are better at acquiring and applying knowledge; including that collected from customer feedback (Peltola & Mäkinen, 2014).

Second, beyond resource requirements, Nambisan (2002) cautioned that, although it is always beneficial to have access to additional sources of knowledge for product development, customer feedback can also become increasingly difficult to implement effectively and manage efficiently. As the amount of customer feedback increases, product development organizations would need to spend significant time and effort on analysing and incorporating the diverse feedback (Sherman et al., 2005). Ultimately, such an overload of information from multiple sources of feedback would complicate decision making and could consequently prolong the product development process (Olson et al., 2001). This consideration might explain why very few organizations have adopted orientations that promote gathering, analysing and utilising any form of customer feedback (Wirtz & Tomlin, 2000). Interestingly, Swink and Song (2007) results indicated the opposite because, despite an increase in total project time, integration between marketing and manufacturing resulted in higher product competitiveness. These authors postulate that the increase in project time might be occurring late in the product development process when the differences between functions become more difficult to resolve.

Third, integration of customer feedback requires product development organizations to become more agile in their ability to adapt to changing customer preferences and issues (Sawhney et al., 2005). This change goes in contrast to some of the traditional product development strategies where future product designs and specifications were developed one or more product generations in advance and with minimal customer input between the releases.

Nevertheless, this is a necessary change since in order for feedback to be used effectively, it must be made a larger driver of an organization's product development process. It is also important to consider that as the amount of customer feedback increases, product development organizations could eventually become overly dependent on customer feedback and even lose their know-how to develop products on their own (Enkel et al., 2005; Veryzer, 1998). Specifically, product development organizations could gradually lose their ability and motivation to develop innovative products, as they would primarily direct their efforts at addressing customer's current needs. Nevertheless, Chesbrough (2003) cautions that a strong, internal R&D function is still a requirement since customer knowledge needs to be translated into a usable form for the product development process. In fact, Chesbrough encouraged changing the role of the R&D department to that of knowledge brokerage, whereby the R&D department would collect and combine knowledge from different internal and external sources (Chesbrough, 2003; Nambisan & Sawhney, 2011).

Due to a lack of relevant research on the subject, many managers have also not yet been convinced of the full benefits of incorporating UOPF as part of the broader product development efforts. Prior research has supported this sentiment since, although social media has been used for general marketing, there is little evidence of it being used for product development due to the uncertainty of reliability of the findings and the returns on investment (Carr et al., 2015; Kietzmann et al., 2011; Maguire, Koh, & Huang, 2007). In actuality, Carr et al. (2015) found that the findings from the social media research were comparable to those obtained using the traditional research methods such as case studies, thus verifying the validity of UOPF as a source of customer feedback. Moreover, research by Litvin et al. (2008) has identified additional insight

beyond what was obtained using the traditional research methods. The authors suspected that the additional insight was generated due to the more neutral setting of social media for generating discussions. This point is directly related to the issue of resource availability since, without the top management support and approval, there will not be enough resources and effort invested into making customer feedback integration a priority amongst competing internal efforts (Dayan, 2010; Donate & de Pablo, 2015; Sethi et al., 2001; Swink & Song, 2007; Troy et al., 2008). Related to the issue of the need for management support, present author would argue that, at least in the case of UOPF, there has not been enough research conducted to better explain what UOPF is, where and how it can be collected, and how its integration would be beneficial to product development organizations. Without this body of knowledge, it is conceivable that many organizations are not fully aware of how to utilize this source of customer feedback properly or are uncertain of the potential benefits, thus minimising the positive impact that UOPF has on product development success.

Even organizations that engage in monitoring UOPF might not be utilising the feedback effectively, properly, or to a sufficiently high degree. The impact of this consideration is that organizations have a natural tendency to resist those integrations efforts that they do not fully understand (Dowlatshahi, 1997). For example, Enkel et al. (2005) state that R&D teams might feel that their internal ideas should be given greater priority over customers' ideas in what is called the "not made here" syndrome. More critically, many organizations learn predominantly from positive experiences and not the negatives ones (Levinthal & March, 1993). As a result, although these organizations experience high levels of organizational learning, they might only be focusing on the positive feedback thus missing the knowledge contained in negative feedback

(Sampson, 1996). Research conducted in the present study remedies this situation by providing empirical evidence of the benefits of UOPF feedback integration, which would subsequently encourage the top management in product development organizations to give these efforts greater resources, flexibility, and decision-making role. This position parallels the previous findings that top management support resulted in product development organizations adopting and practicing higher levels of marketing orientation (Day, 1994; Narver & Slater, 1990).

Finally, product development organizations should balance the benefits of and barriers to using customer feedback as a means of improving their product development process. Each organization will have to decide on the optimum level of UOPFO that will be adopted. Likewise, organizations will have to examine UOPF integration as part of a “Whole system of [customer feedback] methods linked together in an overall process” (Kaulio, 1998, p. 148). Wirtz and Tomlin (2000) explain that organizations need to pick a collection of product feedback collection tools in order to develop an effective feedback collection system. Not surprisingly, Nambisan (2002, p. 406) stated that adding customer feedback into the product development process is a chaotic and demanding process, which requires “A fine balance between overall flexibility and focus and direction”. Table 6 summarizes the organizational and strategic level considerations for organizations that are planning to utilize customer feedback in their product development. These considerations apply to all types of customer feedback, including UOPF.

Table 6: Organizational and strategic considerations for customer feedback integration.

Description of Consideration	Source
Ability to process additional customer feedback is limited by the availability of organizational resources	Cohen and Levinthal, 1990; Marsh and Stock, 2006
Organizations can become overburdened by the sheer volume of customer feedback	Olson et al., 2001; Sherman et al., 2005
Integrating customer feedback requires organizational flexibility	Sawhney et al., 2005
Organizations could over time lose their internal R&D capabilities	Veryzer, 1998; Enkel et al., 2005
Lack of senior management support for customer feedback limits the integration efforts	Sethi et al., 2001; Swink & Song, 2007; Troy et al., 2008
Uncertainty of expected benefits limits the feedback integration efforts	Carr et al., 2015; Kietzmann et al., 2011; Maguire, Koh, and Huang, 2007
Lack of customer feedback integration know-how or positive experiences limits the integration efforts	Levinthal and March, 1993; Sampson, 1996; Dowlathshahi, 1997

2.4.4 Best Practices for Customer Feedback Integration

Previous literature has identified several best practices for effective integration of customer feedback into product development. These best practices can be divided into a triad of technological, organizational process, and cultural (people) factors that improve customer feedback integration efforts. First, effective information technology is an underlying prerequisite for effective integration of customer feedback into the product development process (Donate & de Pablo, 2015; Maguire et al., 2007). Use of information technology is a necessity to manage the tremendous amount of customer information that is collected by product development organizations. Most of the recent reach on the role of customer relationship management (CRM) software has found a link between effective implementation of technology and increased ability to respond to customer needs more effectively (Ernst, Hoyer, Krafft, & Krieger, 2011; Khodakarami & Chan, 2014). Nevertheless, as is dictated by the knowledge-based theory, the ubiquitous nature of information technology in current times has diminished the relative competitive advantage of information technology.

Apart from technology, effective organizations have a formalized customer feedback collection system that spans from marketing to R&D teams that develop the actual products (Wirtz & Tomlin, 2000). The need for formalized units and processes for managing product development has been investigated in prior research (Fundin & Bergman, 2003; Kahn et al., 2012; Maguire et al., 2007). A critical component in managing the flow of information from the source of the collection to the place of eventual use is the presence of a customer feedback unit (CFU). The central role of CFUs is to coordinate and manage the customer feedback to ensure that it is not lost or degraded before reaching the intended recipient (Ernst et al., 2010).

Moreover, CFUs enable an effective flow of information throughout the organization since their direct operational mandate is to manage this information flow. Without the presence of a separate CFU within the organization, which Wirtz and Tomlin (2000) found to be a frequent occurrence, it is highly possible that the customer feedback collected by the marketing unit will not be transmitted outside of the unit as there is very little internal motivation for doing so. Kahn (1996) used agency theory tenants to explain that each department or function acts as an independent agency that is competing for a limited amount of resources and is thus not necessarily acting in the best interests of the overall organization. Workman (1993) even found that some R&D departments conducted their own marketing investigations in the absence of communication with the marketing department. This issue exists even 20 years later with many marketing specialists speculating that an increasing number of departments will conduct their own market research as the relative cost of doing so decreases (Balagué & De Valck, 2013). This finding is supported by Rundquist and Halila (2010) who found that 75% of organizations do not have a formalized product development process. Therefore, it can be concluded that the presence of a CFU, or another similar feedback coordination unit within the product development organizations, is conducive to improved customer feedback sharing between the marketing and R&D functions (Kahn et al., 2012; Olson et al., 1995). Note that the underlying assumption here is that the CFUs are effective at collecting, coordinating and transmitting feedback to the R&D team. Specifically, Goodman, DePalma, & Broetzmann (1996) found that although large companies employed the equivalent of 13 full-time staff to manage customer feedback, very few were capable of successfully acting on the collected customer feedback. Unfortunately, even in the case of the more established feedback types, such as focus groups, many organizations were

significantly lacking in the ability to incorporate the collected customer feedback systematically and effectively into their product development process (Wirtz & Tomlin, 2000).

Finally, there is significant evidence in the literature that the organizational culture itself must change so that the role of customers is perceived as that of “partial employees” whose role is to serve as “organisational consultants” (Liu & Mattila, 2015). For example, Deshpandé et al. (1993) examined the impact of corporate culture on customer orientation, innovation, and ultimately, on organizational performance. Their findings speak to the importance of an organization-wide, corporate culture that promotes customer orientation. Peltola and Mäkinen (2014) found that the absorptive capacity of product development organizations was also increased when the management created a culture that supported the use of social media. Unfortunately, organizations vary on the extent to which they reward their managers and employees for being market-oriented (Jaworski & Kohli, 1993). This consideration is important given that senior management support is a frequently cited driver of organization-wide customer orientation and product development efforts (Füller et al., 2006; Harmancioglu et al., 2007; Kirca et al., 2005; Maguire et al., 2007). In fact, senior management support might be the most important driver of organizational success (Bloom, Reenen, & Brynjolfsson, 2017). In summary, the culture within product development organization has a significant impact on the success of customer feedback integration.

2.5 Literature Review Summary

Section 2.2 explained the role of customer feedback in product development. Background literature on product development process and product success, customer orientation, and cross-

functional integration constructs was also provided. Unfortunately, UOPF has received relatively little attention from the academic community despite the potential benefit for this type of feedback to increase product development success. Chu and Chan (2009) note this deficiency and call for additional studies that link the research on community-based innovation to actual product success in the marketplace. The authors also state the need for better-developed frameworks involving the variables affecting the integration of virtual community feedback into the product development process. The present study answers Chu and Chan's call by providing additional insight into how UOPF integration affects product development success. Nevertheless, previous subsections of this document also discussed numerous potential barriers to customer feedback integration that will need to be considered for.

Second, Jaworski and Kohli (1996) state that while the prior studies used subjective measures of customer orientation and benefits for product development, objective evidence would be especially useful in encouraging organizations to adopt greater levels of customer orientation. One particularly significant limitation of prior findings was that product development success was measured using simplistic measures that did not fully explore the various dimensions of the construct. For example, some studies measured the various constructs described in this section using single-item measures or using purely subjective evaluation criteria. As a result, it is important to verify whether the previous findings are still valid. Finally, previous studies did not typically focus on the consumer electronics industry. The present study addresses these knowledge gaps in the prior literature by using multi-item measures to investigate the impact of UOPF on both the process and product success dimensions of product development success in the consumer electronics industry.

3.0 RESEARCH QUESTIONS

As was stated throughout the present document, though it is likely that most product development organizations are aware of UOPF, very little prior work has gone into quantifying the percentage of organizations that actually integrate UOPF into their ongoing product development process. Similarly, it is important to uncover the benefits of and barriers that product development organizations have encountered while integrating UOPF. Given that the present study is exploring a relatively new research field, it will employ an exploratory empirical approach as was done in similar prior studies (Peltola & Mäkinen, 2014). Consequently, the present study first investigates five exploratory questions into the nature of usage of UOPF in product development:

- Q1:** Are product development organizations in the consumer electronics industry integrating UOPF into their product development process?
- Q2:** How are product development organizations using UOPF in product development?
- Q3:** What benefits are product development organizations expecting to obtain from integrating UOPF into their product development process?
- Q4:** What barriers are product development organizations encountering with integrating UOPF into their product development process?
- Q5:** Do product development organizations show preferences for specific sources of UOPF?

Although the exploratory questions listed above provide useful insight into the nature of UOPF integration into the product development process, it is also important to objectively evaluate the tangible impact of UOPF integration on product development success. This study,

therefore, investigates whether higher levels of UOPFO lead to greater product development process and product success. Furthermore, although existing research has examined the role of customer orientation and cross-functional integration on product development success, these relationships will again be tested in this study, but for the consumer electronics industry and for both the process and product success dimensions. Questions 6 to 9 further the body of knowledge related to product development and also provide practical implications for product development organizations:

- Q6:** Do customer orientation and cross-functional integration impact on product development success in the consumer electronics industry?
- Q7:** Does UOPF exert both a direct and an indirect influence on product development success?
- Q8:** Are there differences in how marketing and R&D managers perceive the role and impact of UOPF on product development success?
- Q9:** Are there differences in how organizations with different numbers of employees perceive the role and impact of UOPF on product development success?

Although the questions listed in this section do not provide a complete answer to this complex and novel topic, they nonetheless serve as a good starting point towards the development of more complex research questions to be addressed in the future. Next section discusses the theoretical framework that will be used to frame and answer the research questions presented in this section.

4.0 THEORETICAL FRAMEWORK OVERVIEW

This section explains and formalizes the relationships between customer orientation, cross-functional integration, UOPFO, and product development process and product success constructs. Subsection 4.1 summarizes the key theoretical underpinnings for each construct that is investigated in the present study. Hypotheses are developed in Subsection 4.2 to answer the empirical questions presented in the previous section. Finally, a tentative model is presented in Subsection 4.3 to summarize the relationships between the constructs investigated in the present study.

4.1 Theoretical Underpinnings

Knowledge, marketing, and organizational learning theories are the principal theories that apply to studies of product development; apart from the innovation theory that has already been described in detail throughout this document. Consequently, the present study develops knowledge in the domains of product and innovation management, marketing research, and organizational management. Other researchers have also found that most prior research on customer collaboration and participation was found in either marketing or innovation literature (Blazevic & Lievens, 2008; Gopalakrishnan & Damanpour, 1997). This finding provides additional support that the literature review in the present study did not miss significant research areas that could have an impact on the findings obtained in the present study. This is especially true given that the very few of the previously cited studies overtly identified their theoretical foundations. Finally, several other theories were uncovered during the literature review process. This finding is not surprising given that no single theory can fully describe the entire spectrum

of organizational operations (Singh & Power, 2009). However, a detailed discussion of additional theories has been omitted here because the other theories were generally subsets of the three main theories presented below. The link between these three theories and the topic examined in this study is described next.

Knowledge-Based Theory

First and most directly applicable theory to this study is the knowledge-based theory of competitiveness. However, before discussing the implications of the knowledge-based theory, it is important to explain that this theory arose from the principles of the resource dependence theory. Resource dependence theory states that superior availability of resources generates a competitive advantage for organizations through greater access to assets and capabilities (Barney, 1991, 2001; Day, 1994). Organizations that have a greater access to R&D funding are arguably in a better position to allocate greater resources for the development of products than organizations with less R&D funding (Cooper & Kleinschmidt, 2007; Ernst, 2002; Sethi et al., 2001). Furthermore, resource dependence theory explains the need for cross-functional integration since each function in a business organization, such as marketing, has access to unique resources required for the accomplishment of interdependent, collective tasks (Pfeffer & Salancik, 2003). Cross-functional integration thus allows the organizational resources to be shared within the organization to where they are most beneficial.

A more recent extension of the resource dependence theory focuses specifically on the unique competitive benefits of knowledge in the post-modern, “knowledge society” (Sawhney & Prandelli, 2000). Focus on knowledge and the increasing acceptance of the knowledge-based

theory was a departure from the traditional preoccupations of organizations on cost-reduction measures as sources of competitiveness (Grant, 1997). Cooper and Kleinschmidt (1986) began promoting the importance of knowledge for product development success in the mid-1980s and from there on, considerable research has been conducted to explain and promote knowledge integration. The importance of resources to competitiveness was further eroded as the markets for resources became subject to the increasing competitive forces (Grant, 1996). To this effect, the knowledge obtained from customers can be considered as a type of an intangible and highly valuable resource that confers benefits to those product development organizations that can obtain, manage, and utilize knowledge effectively (Ipe, 2003; Nonaka & Takeuchi, 1995; Stewart & Ruckdeschel, 1998).

The positive impact of customer feedback on product development is explained by noting that knowledge has a positive impact on innovativeness and creativity, both of which have been shown to drive product development success (Ipe, 2003). More significantly, as was stated at the beginning of this document, product development process is fundamentally an uncertain process. Therefore, information that can demystify the customer requirements is a valuable resource that needs to be made available to the product development teams (Ernst et al., 2010). Grant (1996, p. 375) even stated that the “Primary role of the firm, and the essence of organizational capability, is the integration of knowledge”. Consequently, the present study positions that customer feedback, even when critical in nature, is a form of knowledge that can provide a competitive advantage to those product development organizations that can properly integrate this knowledge into their product development process. A solid understanding of knowledge-

based theory is important as it sets the precedent for the majority of the work conducted in the present study.

Marketing Theory

Many articles identified during the literature search process were based on the underpinnings of the marketing theory and the related sub-theories. This finding is expected given that the research topic presented in this paper is found at the frequently researched interface between marketing and R&D departments of product development organizations (Kahn, 1996; Sawhney et al., 2005; Workman Jr, 1993). First, the consumer decision making process explains the purchasing decisions of customers and the approaches that product development organizations use to identify and address customer demands. In fact, most of the literature on demand enhancing properties of online product feedback and sentiment analysis is part of the marketing theory research domain. The wealth of research on this topic follows the rise in information technology that has resulted in an explosion of customer products (hyperdifferentiation), the implications of which are understood through marketing theory principles (Clemons, Gao, & Hitt, 2006). Marketing theory also provides a good understanding of how organizations interact with customers for the purpose of obtaining customer feedback to both build relationships with customers as well as to obtain input for product development. Finally, the marketing construct, a cornerstone of the marketing theory, states that successful firms satisfy the needs of their customers better than their competitors (Day, 1994; Kirca, Jayachandran, & Bearden, 2005). In the case of product development organizations, it is the role of marketing to understand and translate the needs of customers so that better products can be developed.

Marketing research provides the theoretical support for the development of two constructs used in the present study. The first construct, **customer orientation**, examines the attitudes and behaviours that organizations have towards involving their customers into the internal organizational product development process. The second construct developed based on marketing theory tenants is that of **UOPFO** which examines the attitudes and behaviours that product development organizations have towards using UOPF as a source of knowledge. This second construct has not been examined in prior research and is, therefore, one of the novel contributions of the present study.

Organizational Learning Theory

Finally, a large quantity of relevant prior research is based on the organizational learning theory principles. Organizational learning theory is useful in the present study since it provides the context for understanding the drivers, obstacles, and consequences of knowledge flow within organizations. Specifically, while the marketing theory explains the processes required to bring customer feedback into a product development organization, it is the organizational learning theory that provides an understanding of how customer feedback is shared within the product development organization (Nambisan, 2002; Slater & Narver, 1995). Although Nambisan (2002) had developed his research primarily based on the knowledge-based view of the firm, he nonetheless considered organizational design principles that can be grouped as facets of the organizational learning theory. Organizational learning theory principles are used to develop the **cross-functional integration** construct.

Several articles examined the processes through which knowledge is transferred from one department to another for the purpose of organizational learning. For example, Ipe (2003) investigated knowledge transfer within organizations in detail with a discussion of not only the benefits of effective knowledge transfer, but also the key difficulties preventing effective knowledge transfer in organizations. Ultimately, Ipe concluded that the most effective organizations built informal and reciprocal relationships between different parts of the organization that allow for greater knowledge sharing. This knowledge can then lead to organizational learning which influences the organization to adopt behaviours that can increase product development success (Baker & Sinkula, 1999; Slater & Narver, 1995). Similarly, Sethi (2000) investigated how organizational learning and information flow into and through an organization improve an organization's ability to respond to market needs.

Research on this subject matter is important because previous research on customer feedback integration has shown that while feedback is often collected, it does not necessarily reach the specific individuals and teams in charge of product development (Workman Jr, 1993). Moreover, it is even possible that the barriers to information and knowledge flow within organizations are the most significant factors preventing customer feedback from being utilized more often. Baker and Sinkula (1999) examine this very point in their study where they contend that market orientation by itself does not lead to product innovation and organizational performance in the absence of a learning organization. As can be observed from Baker and Sinkula's framework shown in Appendix B, both an externally looking market orientation and an internally focused learning orientation are required for organizations to develop innovative products. This perspective parallels the one presented in the present study, whereby customer

orientation is responsible for making organizations receptive to external knowledge and cross-functional integration is responsible for sharing the knowledge throughout the organization.

4.2 Construct and Hypothesis Development

Four previously operationalized and one new constructs are investigated in the present study. Each construct is described in greater detail below along with the associated hypotheses that are proposed and empirically tested. Recall that for the purposes of the present study, the term orientation refers to the practical implementation of a construct.

Customer Orientation

Customer orientation construct was explained in detail in Subsection 2.4.1, where it was stated that in a large number of studies, apart from expected differences in research methodologies and theoretical underpinnings, higher levels of customer orientation have resulted in higher levels of product development success (Deshpandé et al., 1993; Kirca et al., 2005; Narver & Slater, 1990; Wong & Tong, 2011). According to Wong and Tong (2011, p. 35), customer orientation increases success in competitive industries by allowing firms to “identify the right market; formulate the most suitable entry strategy; target customers that can provide high lifetime value; fully understand customers' preferences and needs; and closely monitor changing market needs so that new products can be developed to satisfy them.” Therefore, according to this definition, customer orientation refers to interactions with customers for the purpose of gaining knowledge that can be used to develop better products.

The first two hypotheses investigate whether customer orientation leads to process and product success. While both of these hypotheses have been tested by prior research in terms of the overall product development success, they are tested again in this study as they serve as a fundamental stepping stone towards the development of more specific and novel hypotheses discussed later in this subsection. Furthermore, very few of the prior studies identified in the literature focused on the consumer electronics industry, thus the findings from this study could provide unique insights into this specific industry.

Hypothesis 1a: *Higher levels of customer orientation lead to higher levels of product success.*

Hypothesis 1b: *Higher levels of customer orientation lead to higher levels of process success.*

Cross-functional Integration

As was discussed in Subsection 2.4.2, cross-functional integration enhances the transfer of customer feedback from the marketing department, which is the “face of an organization”, to the R&D department where customer ideas are used in the product development process. Higher levels of cross-functional integration are expected to increase the speed and effectiveness with which customer feedback is shared within the organization thus leading to product development process success (Garrett et al., 2006; Griffin & Hauser, 1996; Narver & Slater, 1990; Wong & Tong, 2011). In particular, Wong and Tong (2011, p. 35) summarize prior research that found that successful R&D-marketing collaboration can help organizations to “Understand customer needs and preferences; reduce new product uncertainties; improve the performance of a new product in terms of quality, cost, and time to market; and improve the success rate of new products”. This approach is also applicable given that Keller (2001) identified communication

and sharing of information as the primary factors that drive cross-functional teams to have a positive impact on product development.

The third hypothesis tests the relationship between cross-functional integration and product development process success. Including this hypothesis in the present study is important since it ensures that a lack of knowledge flow within the organization does not mask the impact of customer orientation or UOPFO on product development success. One novel aspect of testing this relationship again in the present study is the study's focus on the consumer electronics industry that, as was mentioned before, has not received significant investigation by researchers in this field. This hypothesis will also verify prior findings that customer orientation alone is not sufficient for product development process success since organizations also have to be able to share the knowledge throughout the organization (Baker & Sinkula, 1999). Note that a relationship between this construct and product development product success is not tested since cross-functional integration is internal to product development organizations and is therefore not likely to directly influence the success of products in the marketplace.

***Hypothesis 2:** Higher levels of cross-functional integration lead to higher levels of process success.*

UOPF Orientation

The role of the marketing function in identifying and collecting customer feedback was already discussed extensively in this study. However, based on the extensive literature review, no identifiable prior research exists that has specifically investigated the impact of UOPFO on

product development success. Consequently, the most novel investigation in this study examines whether product development organizations that integrate UOPF achieve higher levels of process and product success than those organizations that do not integrate UOPF.

To begin, UOPFO is expected to be correlated to customer orientation and cross-functional integration. Knowing that organizations have been collecting customer feedback long before the advent of the Internet, it is conceivable that organizations with higher levels of customer orientation are more likely to exhibit higher levels of UOPFO. These organizations are more open to integrating customer feedback into the product development process and would thus be more willing to use additional sources of customer feedback such as UOPF. Similarly, organizations with higher levels of cross-functional integration are typically better able to integrate the additional knowledge that is captured via UOPFO. The effects of customer orientation and cross-functional integration on UOPFO are tested via the following two hypotheses:

Hypothesis 3: Higher levels of customer orientation lead to higher levels of UOPFO.

Hypothesis 4: Higher levels of cross-functional integration lead to higher levels of UOPFO.

Two hypotheses test the effect of UOPFO on product development process success and product success. First, as was discussed in the section on the role of UOPF in affecting online customer buying intentions, UOPFO is hypothesized to have a direct impact on product success by affecting the sales potential of products. Specifically, product development organizations that have adopted a UOPFO will demonstrate to customers that they are addressing issues brought

up by customers and shared via UOPF. This commitment will develop customer loyalty and satisfaction that impact on product success since they result in increased repeat purchases and positive word of mouth (Kirca et al., 2005; Kumar et al., 2010; Szymanski & Henard, 2001). Moreover, products that are being updated and improved through UOPF could be more likely to receive positive feedback and reviews that will encourage other customers to purchase the same product (Kumar et al., 2010). UOPFO is also expected to have a positive impact on process success since it contains a large amount of customer feedback that is rich in suggestions for improvements and for the development of new products (Füller et al., 2006). This rich information can improve a product development organization's own internal product development processes by reducing product development time and costs (Chen et al., 2010; Tessarolo, 2007).

Hypothesis 5: Higher levels of UOPFO lead to higher levels of product success.

Hypothesis 6: Higher levels of UOPFO lead to higher levels of process success.

Product Development Success

Subsection 2.1.3 explained that it is possible to measure product development success with respect to either the actual product development process itself or with respect to the ultimate output of this process, which are the finalized products. The final hypothesis investigates the relationship between product development process success and product success. Specifically, prior research has found that a successful product development process can lead to higher levels of product success. For example, Tessarolo (2007) found that a rapid product development

process is both an indication of how successful the process is, but that it also has a positive impact on the product success. Kirca et al. (2005) state that improved product quality and innovativeness, that would be achieved through higher levels of product development process success, lead to more competitive and desirable products. Finally, product success is said to be a good measure of product development process success since it captures both a product's desirability to customers and its quality (Swink & Song, 2007).

Hypothesis 7: Higher levels of process success lead to higher levels of product success.

4.3 A Priori Model Development

The eight hypotheses presented in the previous subsection (summarized in Table 7 below) form the basis of the tentative, *a priori* model shown in Figure 6. To begin, the model postulates that both customer orientation and cross-functional integration impact positively on process success. UOPFO has a mediating effect on the relationship between customer orientation and product and process success since it is expected to provide greater volume and richness of feedback from customers for organizations that collect and utilize UOPF. For its part, UOPFO is affected by both customer orientation and cross-functional integration since both of these capabilities should be present in organizations that wish to integrate UOPF effectively. This last assertion was explained in Section 2.0 by noting that UOPFO is not likely to occur if organizations do not first have high levels of customer orientation. If organizations do not feel that their customers are an important part of their core business, then they will not consider their customers' online feedback to be of value either. Similarly, UOPFO cannot be integrated successfully into organizations that do not have high levels of cross-functional integration that

is required to collect and disseminate an additional source of knowledge throughout the organization.

Observe that UOPFO is listed in the model as a mediator rather than as a moderator because UOPFO is expected to be correlated to customer orientation and cross-functional integration. Although there is still a large amount of debate in the literature on the differences between interaction effects, Baron and Kenny (1986) seminal work is still cited extremely frequently and it states that moderators are not correlated with the independent or dependent variable (Little, Card, Bovaird, Preacher, & Crandall, 2007). Consequently, UOPFO is perceived as a mediator of the relationships between customer orientation and product development process success, because UOPFO is a practical consequence of customer orientation. Similarly, UOPFO is also perceived as a mediator of the relationship between cross-functional integration and product development process success. Nevertheless, it is difficult to know without testing if full or partial mediation exists, thus both possibilities have been included in the model. This uncertainty is compounded due to the fact that UOPFO has not been researched before and its role within product development is therefore investigated in the present study. Finally, process success has a direct impact on product success. The reasoning for these relationships was provided in Subsections 2.4.1, 2.4.2, and 4.2.

Table 7: Summary of research hypotheses tested in the present study.

Hypothesis	Description of Relationships Tested
1a	Higher levels of customer orientation lead to higher levels of product success.
1b	Higher levels of customer orientation lead to higher levels of process success.
2	Higher levels of cross-functional integration lead to higher levels of process success.
3	Higher levels of customer orientation lead to higher levels of UOPFO
4	Higher levels of cross-functional integration lead to higher levels of UOPFO.
5	Higher levels of UOPFO lead to higher levels of product success.
6	Higher levels of UOPFO lead to higher levels of process success.
7	Higher levels of process success lead to higher levels of product success.

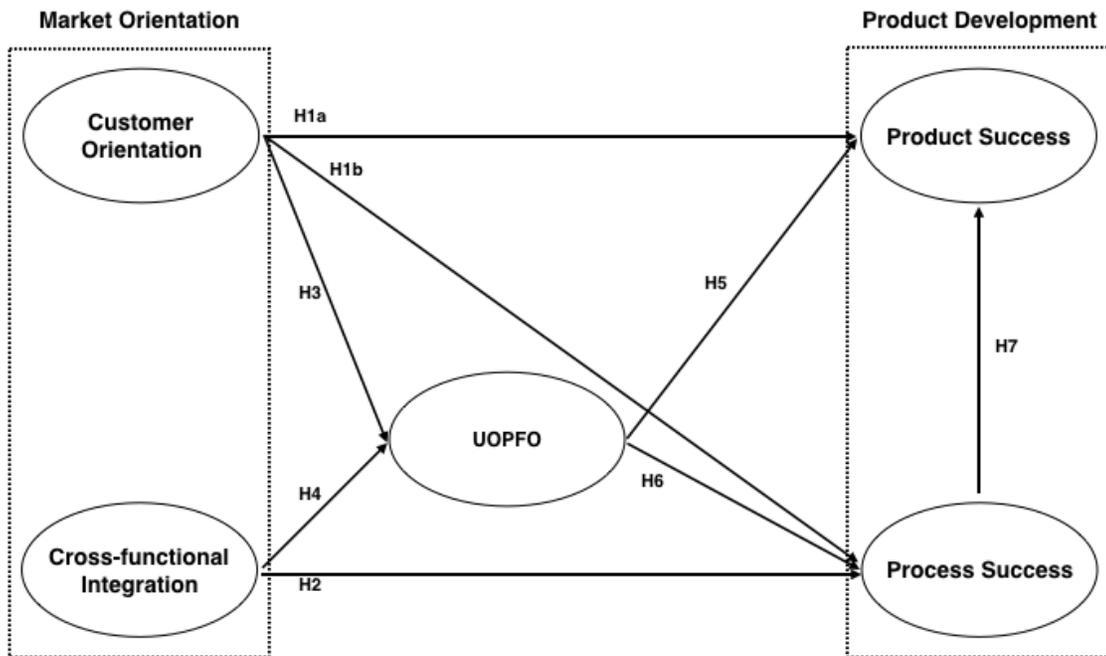


Figure 6: The *a priori* framework for the role of UOPFO in product development.

Next, two different controls, industry type and organizational size, are used in this study. Industry type is used as a control to ensure that the industry size and level of competition are controlled for as they can have a significant impact on product success (Harmancioglu et al., 2007). Prior research has determined that industry type control comprises the three most commonly identified sources of environmental turbulence: the level of competition, the level of technological turbulence, and the amount of turbulence with respect to customer dynamisms (Harmancioglu et al., 2007; Joshi & Sharma, 2004). While some of the earlier studies have examined these environmental factors individually, the present study will use the combined approach discussed above in order to simplify the data collection and analysis process (Jaworski & Kohli, 1993). Industry type was also found by Atuahene-Gima (1995) and Ernst et al. (2010) to moderate the impact of customer orientation on product development performance, thus further supporting the decision to include this control. The present study controls for industry type by focusing exclusively on the consumer electronics industry. Consumer electronics industry is turbulent since it experiences significant global competition from existing and newcomer organizations, short product development lifecycles, and rapidly changing customer preferences (“CTA - U.S. Customer Technology Sales & Forecasts 2012-2017,” 2017).

In addition to industry type, Narver and Slater (1990) approach of controlling for organizational size will also be used. Organizational size serves as an important control given that larger organizations are more likely to have the resources necessary to collect and integrate customer feedback (Marsh & Stock, 2006). Large organizations are also more likely to experience difficulties with managing information flow within the organization, which could determine whether the collected customer feedback actually reaches the R&D teams (Lin &

Huang, 2012). Finally, Kahn (2001) only included organizations with more than 100 employees in their study since he assumed that smaller organizations might not have an organizational structure consisting of well-defined marketing and R&D departments. Following this recommendation, the present study only contacted individuals who were working in organizations with 100 or more employees. Further research will have to be conducted to determine how each of these controls impacts on the relationship between UOPFO and product development success.

5.0 RESEARCH METHODOLOGY

This section describes in detail the methodological approach that was used to identify, collect, and summarize the research data. It is first important to clarify that previous research on the role of customer feedback in product development has employed either a behavioural or attitude/cultural perspective to conduct the research (Ernst et al., 2010; Homburg & Pflesser, 2000). Behavioural perspective examines behaviours that are demonstrated through activities that product development organizations undertake to obtain customer feedback (Kirca et al., 2005). In contrast, the attitude/cultural perspective examines the organizational norms and values that encourage behaviours that are consistent with marketing orientation (Narver & Slater, 1990). Studies usually focus on one perspective since the two approaches “may have different effects on NPD project performance and carry different management implications” (Olson et al., 2001, p. 260). The present study favours the behavioural perspective, as was done in several prior studies, since the presence of behaviours is easier to measure than the presence of attitudes (Ashok Gupta et al., 1986; Kohli & Jaworski, 1990; Olson et al., 2001; Song & Parry, 1992). Moreover, behaviours are a more tangible indication of UOPF integration than attitudes which might be espoused, but not practised, thus serving as poor indicators of UOPFO.

For the remainder of this section, Subsection 5.1 discusses the research sample and data collection including a discussion of how some research challenges were overcome. Subsections 5.2 and 5.3 discuss the variable and measurement development, respectively.

5.1 Research Sample and Data Collection

Industry Investigated

The primary goal of the present research study is to obtain insight into the level, nature and impact of usage of UOPF by product development organizations in the consumer electronics industry. As a result, the target sample in the present study is composed of product development organizations in the North American consumer electronics industry that are classified with the Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) codes shown in Table 8. Information about the Canadian product development organizations was obtained from the Canadian Company Capability Registry which is provided by Innovation, Science and Economic Development Canada (formerly Industry Canada) (Government of Canada, 2012). Contact information for the United States organizations was obtained from Joe's Data (joesdata.com) which is an online service that provides contact information for sales prospecting. Additional contacts from Canada and the United States were obtained by using LinkedIn social networking service to contact individuals who were self-identified as current marketing or R&D managers in North American consumer electronics organizations.

Table 8: SIC and NAICS codes for the consumer electronics industries studied.

Industry	SIC Code	NAICS Code
Electronic computers	3571	334111
Household audio and video equipment	3651	334310
Wireless telecommunications	3663	334220

The above approach allows the industry type to serve as a control. Furthermore, very little research has been done on the consumer electronics industry, thus increasing the contribution of the findings obtained from the present study for the innovation literature. Finally, a review of the prior literature did not find significant differences between consumer electronics organizations in Canada and the United States, thus both countries were examined in the present study in order to increase the number of responses collected. Responses from other countries were not considered since national culture outside of North America can impact on feedback integration and communication (Garrett et al., 2006; Goodrich & De Mooij, 2014).

Target Sample

Target sample for the present study are marketing and R&D managers in the North American consumer electronics industry and is comparable to the samples employed in previous studies (Gruner & Homburg, 2000; Harmancioglu et al., 2007; Kahn, 1996, 2001; Lawrence & Lorsch, 1986; Olson et al., 2001; Song & Parry, 1992). These respondents are chosen as they are in the best position to provide feedback on the constructs and relationships investigated in the present study. Specifically, given that previous research has found a disconnect between the

customer feedback collected by the marketing department and the information that reaches the R&D department, this research approach will help to elucidate any areas of discourse between these functional areas. For example, in the textile industry, Kahn (2001) found that marketing and R&D managers had very different perceptions of the impact of marketing orientation on new product development. Table 9 summarizes the research methodologies used in frequently cited research studies over the past 20 years.

Table 9: Research methodologies employed in notable product development studies.

Author(s)	Year of Publication	Region Analysed	Industry Analysed	Principal Respondents
Narver and Slater	1990	Western	Forestry equipment	Top management
Deshpandé et al.	1993	Japan	Not stated	Divisional marketing executives
Jaworski and Kohli	1993	USA	Various	Marketing and non-marketing managers
Kahn	1996	USA	Electronics	Marketing, R&D and manufacturing managers
Kahn	2001	USA	Textile and apparel	Marketing, manufacturing, and R&D managers
Olson	2001	USA	Various	Project managers
Swink and Song	2007	USA	High-tech	Marketing and manufacturing managers
Harmonious et al.	2007	USA	Building material	Marketing, manufacturing, R&D managers
Ernst et al.	2010	Germany	Various	Sales, marketing, R&D managers
Wong and Tong	2011	China	Electronics	Managers
Lin and Huang	2012	Taiwan	Electronics	Senior managers including R&D
Cuevas-Rodríguez et al.	2014	Spain	Manufacturing and services	Marketing and R&D managers
Lynch et al.	2016	Ireland	Various	Managing and NPD directors

Unit of analysis

Units of analysis in this study are the product development organizations and their marketing and R&D units given that the goal of the study is to determine whether differences in the levels of UOPFO are responsible for differences in product development success. As was done by Kahn (2001), only organizations with more than 100 individuals were selected since these organizations were more likely to have separate marketing and R&D departments. According to Statistics Canada, organizations with more than 100 employees but less than 500 are identified as medium-sized organizations and with 500 or more as large (Leung, Rispoli, & Chan, 2012). The present study, therefore, uses organizational size as the second control as it only contacted medium and large organizations with at least 100 employees. Next, the present study was conducted at the business unit level rather than at the project level since the focus on business units overcomes several shortcomings of focusing on project level research (Cooper & Kleinschmidt, 2007). Most notably, Cooper and Kleinschmidt (2007) argue that product development research done at the project level misses the broader organizational behaviours that impact on both successful and unsuccessful projects, thus preventing these behaviours from emerging during the analysis.

Questionnaire

The proposed model presented in Subsection 4.3 was tested using data gathered through both SurveyMonkey and Qualtrics online surveys administered to a representative sample of managers working for product development organizations in the consumer electronics industry. SurveyMonkey is a popular service for creating and administering surveys and was chosen for

this study because it is relatively inexpensive, easy to prepare and administer, and is secure. Qualtrics™ is another service for collecting survey responses and is the official survey research provider of Carleton University. Nevertheless, the survey questionnaire used was exactly the same for both of these services. The reason for the switch was that the data collection took longer than expected which resulted in the SurveyMonkey subscription expiring in June 2017. Qualtrics was subsequently used to host the survey from June until July 2017. Survey invitees were not aware of the change since the anonymous link used in the invite email was redirected to Qualtrics instead of SurveyMonkey.

Online survey methodology was chosen for the present study due to specific advantages of online survey administration. Wong and Tong (2011, p. 36) state that online surveys are appealing to social scientists because of “their relatively low cost, fast response, the convenience of administration, ease of data entry and analysis, and absence of geographical restrictions”. More significantly, it is increasingly difficult to obtain responses for social science research using direct email or telephone contacts due to privacy laws that restrict the publishing and sharing of contact information. Online surveys mitigate this restriction by allowing researchers to send survey invite links to prospective respondents via social media such as LinkedIn even if the respondents’ emails, telephone numbers, or addresses are not publicly listed. However, online surveys do tend to suffer from lower response rates since the researcher’s identity cannot be immediately verified by prospective respondents and since the propensity of online surveys in recent years has led to survey fatigue (Benfield & Szlemko, 2006; Bryman & Bell, 2011).

Survey questions were developed and improved based on the suggestions and guidance found in Fowler (1995) “Improving Survey Questions: Design and Evaluation”. In particular, Fowler provided practical guidance on developing survey questions that were neither ambiguous nor prone to response bias. Frohlich (2002) suggestion to develop a survey that is relevant and not time-consuming was also followed in order to increase the response rates. The relevance of the questionnaire was achieved due to the importance of the research questions answered by the study and the promise to provide the respondents with a summary of the final results. In addition, the survey consisted of 38 multiple-choice questions, thus eliminating the need for the respondents to invest significantly longer than 8 minutes to complete the survey. Finally, the survey invite offered all participants an opportunity to be entered into a prize draw for a \$25 Starbucks gift card and a summary of the study findings. The survey invite, introduction and questions are presented in Appendices E, F, and G, respectively. Table 33 in Appendix H maps the survey questions to research questions presented in Section 3.0.

Two types of questions were employed in the survey questionnaire. First, exploratory questions asked the respondents to either select all appropriate responses to a question or to rank order their preferences from a list of predefined responses. This type of questions included questions pertaining to respondent demographics and inquired about the type, benefits, barriers, and nature of UOPF usage in their organizations. In order to minimize response bias, the ordering of all questions of this type was automatically randomized. Finally, whenever a question asked the respondents to select all appropriate responses, there was also an option for respondents to select “other”. This last option subsequently provided the respondents with a free-text field where they could provide additional clarification of why they chose the “other” option.

The second type of questions measured the variables in the model. These questions were evaluated using 5-point Likert scales in order to allow the respondents to indicate the degree or extent to which they agreed with the survey questions. Although some researchers prefer to use 7-point Likert scales, 5-point scales are easier for respondents to comprehend and are generally not much less accurate than 7-point scales (Colman, Morris, & Preston, 1997; Dawes, 2008). For questions pertaining to customer orientation, cross-functional integration and UOPFO, the measurement scale ranged from “strongly disagree” to “strongly agree”. For questions pertaining to product development process success and product success, the scale was modified to include more positive responses in order to increase the response spread: “Not at all, a little bit, quite a bit, a great amount, extremely.” This was done on the assumption that respondents from large, well-known and successful organizations sampled in this study would likely rate their product development as successful. In retrospect, this should have also been done for the customer orientation construct scale since it too generated overwhelmingly positive responses. One explanation for this is that large, successful organizations are well aware of the importance of developing and maintaining a strong customer orientation. Finally, disqualification logic was applied to respondent demographic questions in order to screen out undesirable responses.

Two additional challenges were considered while developing the questionnaire. First, online surveys preclude researchers and respondents to communicate directly. This created a challenge with respect to explaining to respondents what the exact definition of “UOPF” was. Individuals that were not familiar with this specific nomenclature might have answered the survey questions based on their own interpretation of the construct. This challenge was mitigated by describing all the constructs in detail in the survey instructions and then again on each relevant

page, thus ensuring that all respondents were responding based on a common understanding of the construct. Furthermore, the instrument was validated with both academics and practitioners, thus ensuring clarity of the survey questions before they were sent to respondents.

The second and more substantial challenge was that respondents might have decided to not complete the survey out of fear that they would be providing proprietary information about their product development process. This was a particularly significant consideration in the highly competitive and knowledge-driven consumer electronics industry. Although this challenge occurs with many types of management research, it was addressed by assuring the respondents in the survey introduction that their responses were anonymous. This challenge was also addressed by using survey items that struck a good balance between specificity and generalizability, thus increasing interest in the survey topic without appearing overly intrusive (Fowler, 1995). Finally, the survey invite and introduction indicated that the research study was approved by the Carleton University Research Ethics Committee, thereby informing the respondents that the study had passed ethical research screening and further assuring them of the legitimacy of the survey invite.

5.2 Variables

The constructs described in Section 4.2 can be considered as the independent, dependent, and mediating variables used in this study. **Independent variables** are the levels of customer orientation and cross-functional integration. Although many previous studies have considered these two constructs, they were typically presented as not having direct interactions with each other than being sub-dimensions of the marketing orientation. **Dependent variables** are the

levels of product development process success and product success. These two dimensions constitute different aspects of product development success, which in turn, could lead to financial and organizational success. However, as was previously explained, this study does not directly examine the impact of product development success on organizational or financial success. The level of UOPFO within a product development organization is envisioned as both a **dependent** and **mediating variable** since higher levels of UOPFO are expected to lead to additional, indirect effects of customer orientation and cross-functional integration on process success and product success. UOPFO is also directly influenced by customer orientation and cross-functional orientation.

5.3 Measurement Development

Measures for each of the variables used in this study are first discussed in detail below and then summarized in Table 10. All the variables used in the present study form latent or unobserved factors since it is not possible to directly measure intangible and abstract constructs such as customer orientation. Instead, measurement items in the form of survey questions are used as observable measures of the latent variables. In order to capture all the features and multidimensional aspects of the constructs, each construct examined in this study was measured with a multi-item scale consisting of at least four items (Raubenheimer, 2004). More significantly, this approach was done in contrast to some earlier studies that used only a single-item measure of product development success. According to recent studies, multi-item measures are preferable to single-item measures in social science research since they are better able to measure the underlying constructs (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). Finally, using at least four items allows for the possibility of dropping one item per

measure, if necessary due to poor item loadings or other issues, and still being able to model relationships between variables.

The first construct measured was the level of **customer orientation** in a product development organization. This construct was measured using the well-established measures of customer orientation that were used in the marketing literature (Deng & Dart, 1994; Deshpandé et al., 1993; Gruner & Homburg, 2000; Kahn, 2001; Narver & Slater, 1990). The only changes to the measurement items were slight modifications to wording in order to improve clarity and to maintain stylistic consistency across questions. Recent research has verified Narver and Slater (1990) measures of market orientation and concluded that the customer orientation sub-dimension can be used as an independent construct (Ward, Girardi, & Lewandowska, 2006). The second construct, the level of **cross-functional integration**, was also measured using measurement items that were established in existing literature on organizational knowledge sharing and interdepartmental integration (Deng & Dart, 1994; Homburg & Pflesser, 2000; Kahn, 1996, 2001). As can be noted, several prior studies examined both of these constructs within the same study. This finding is not surprising given the previously described relationship between these two constructs as sub-dimensions of marketing orientation and hence their frequent combined analysis.

The third construct measured was the level of **UOPFO** that product development organizations have adopted. Unlike the measures of customer orientation and cross-functional integration, measurement items for UOPFO were developed specifically for the present study since there were no prior studies identified that have developed and tested the items for this

specific construct. Fortunately, the procedures for developing new measurement items have been developed and refined by psychologists since the 1960s and have also been successfully applied in management research (Deng & Dart, 1994). New measurement items were developed for the present study using the 4-step procedure that was described in Jaworski and Kohli (1993). This particular research article was chosen since the procedure steps were both clear and described in detail. First, a large number of measurement items was compiled based on items used in the peripheral research fields. Marketing constructs served as a particularly good starting point for the development of UOPF specific measurement items since they also explore the relationship between customers and organizations (Homburg & Pflesser, 2000; Kahn, 2001). Similarly, recent research on the development of social networks between product development organizations and customers has proposed frequency and intensity of online interaction as measures of the strength of this network that can be used as an indication of openness of organizations towards collecting and using UOPF (Lynch, O'Toole, & Biemans, 2016). Organizations that engage online customers for feedback more frequently and deeply are thus assumed to exhibit higher levels of UOPFO. Other items were developed to "Tap the domain of each construct as closely as possible" by asking questions that measure the construct from multiple perspectives (Jaworski & Kohli, 1993, p. 58). A domain can be defined succinctly as a collection of informational entities on a specific subject (Hjørland & Albrechtsen, 1995). Second, the large pool of initial measurement items was narrowed down to select only those items that were the most clear and likely to assess the different "shades of meaning" of this construct. Third, the items were pre-tested for clarity and appropriateness with 8 academics in marketing, product development, and technology management fields. This step was important for improving the validity of the measurement scales thereby reducing measurement error (Ping,

2004). Finally, based on the feedback from the academics, revised items were pre-tested with 4 marketing and R&D managers in the consumer electronics and IT industries. It should be noted that the order of the third and fourth steps was reversed compared to what Jaworski and Kohli (1993) proposed since it was more practical to conduct the first phase of pretesting with academics rather with than practitioners. Moreover, although Jaworski and Kohli performed their pretesting with 27 individuals, there are no definitive guidelines for the minimum number of individuals that should be used in pretesting. Previous research has recommended anywhere from 12 to 30 individuals for pretesting and a good rule-of-thumb is that pretesting should continue until experts agree on a final set of measurement items (Hunt, Sparkman, & Wilcox, 1982). Hunt et al. (1982, p. 270) further suggest that “if the ultimate questionnaire is to be used with very unsophisticated target populations, it would require a larger pretest sample than would one intended for a sophisticated audiences.” Consensus was achieved in the present study with 8 knowledgeable participants and the target sample of the ultimate questionnaire were well-established managers, thus the pretest sample size was deemed to be adequate. Overall, a pretest of the UOPFO measurement items with academics and practitioners did not identify any major issues with the chosen items apart from minor suggestions for improving the format and wording of the questions.

As was stated in Section 2.1.3, product development success was measured through **process success** and **product success** dimensions. First, the present study is using objective measures of process and product success instead of subjective ones since there have been some conflicting findings on the impact of customer orientation on product development success based on which type of measure is used (Jaworski & Kohli, 1993). Second, both the process success

and product success dimensions were assessed using previously operationalized multi-item measures, which is a slightly different approach from single-item measures that were employed in the previous research studies (Kahn, 1996; Lawrence & Lorsch, 1986). For example, findings from Jaworski and Kohli's (1993) seminal study were all based on the responding managers' subjective perceptions of the overall performance of the business unit and the success when compared to their competitors. Similarly, Narver and Slater (1990) study measured the impact of market orientation on an organization by solely measuring the return on investment. Finally, Kahn (2001) also used only a single, highly subjective measure of product development success where the respondents rated their product development performance on a scale of 0-100%. Kahn himself stated that one of the limitations of his study was that it was based on a single, self-perceived evaluation of performance. The present study improves upon the prior studies by utilising multi-item measures of process and product success dimensions of product development success. Moreover, as Kirca et al. (2005, p. 32) have discussed in their methodology section, "Multi-item measures are more capable of capturing various facets of complex constructs."

Table 10: Literature sources of construct measurement scales ordered by date.

Construct	Sources of Measurement Scales	Measurement Item Changes
Customer Orientation	Deshpande et al. (1993); Jaworski and Kohli (1993); Deng and Dart (1994); Homburg and Pflesser (2000); Kahn (2001)	Adapted from literature with minor wording modifications
Cross-functional Integration	Deng and Dart (1994); Kahn (1996); Kahn (2001); Olson et al. (2001); Rodriguez (2008)	Adapted from literature with minor wording modifications
UOPFO	Ernst et al. (2010); Lynch, Toole, and Biemans (2016)	Developed for the present study based on measures for constructs in peripheral fields of study
Process Success	Olson et al. (2001); Hong et al. (2004); Marsh and Stock (2006); Li and Huang (2012)	Adapted from literature with minor wording modifications
Product Success	Hong et al. (2004); Marsh and Stock (2006); Swink and Song (2007); Ernst et al. (2010); Dayan (2010); Li and Huang (2012)	Adapted from literature with minor wording modifications

Controls for the present study, consisting of industry type and size of the organization, were identified based on the most frequently used control variables in the prior literature. Recall that industry type is a good proxy for the more specific controls such as environmental and technological turbulence and level of competition. Similarly, organizations should have more than 100 employees in order to have distinct marketing and R&D functions (Atuahene-Gima et al., 2005; Kirca et al., 2005; Lin & Huang, 2012). Respondents either met the requirements of these two controls or were disqualified from the survey using a disqualification logic applied in the survey introduction. Finally, Table 11 lists the coding scheme that will be used from this point forward in the present study to identify the variables and measurement items for customer orientation (CO), cross-functional integration (CFI), unsolicited online product feedback

orientation (UOPFO), product development process success (PRCS) and product development product success (PRDS) constructs.

Table 11: Measurement item coding and questions for each variable.

Variable	Item Coding	Question
CO	CO1	We frequently engage our customers for feedback.
	CO2	Maintaining a long-term relationship with customers is important to us.
	CO3	Customers are an important part of our R&D process.
	CO4	We reward our employees for responding to customer needs.
CFI	CFI1	We organize cross-functional meetings regularly.
	CFI2	We have a business-wide process for sharing knowledge between units.
	CFI3	We place much value on information flow within our business.
	CFI4	Different functions in our business work as teams.
UOPFO	UOPFO1	We have substantial experience with unsolicited online product feedback.
	UOPFO2	Our senior management sees value in collecting unsolicited online product feedback.
	UOPFO3	We have a specialized team that collects unsolicited online product feedback.
	UOPFO4	We collect unsolicited online product feedback from various sources.
	UOPFO5	We reward our employees for discovering valuable unsolicited online product feedback.
PRCS	PRCS1	We develop our products rapidly.
	PRCS2	We develop our products within budget.
	PRCS3	We develop our products on schedule.
	PRCS4	Our product development process is innovative.
PRDS	PRDS1	Our products achieve high customer ratings.
	PRDS2	Our products achieve higher market share than our closest competitors' products.
	PRDS3	We develop products that meet our customers' quality expectations.
	PRDS4	Our products generate a positive return on investment.

6.0 ANALYSIS

This section summarizes the analytical procedures that were done to prepare and analyse the data. First, Subsection 6.1 describes the preparation of the data for analysis. Subsection 6.2 presents the exploratory and confirmatory factor analysis. Subsection 6.3 presents the measurement model reliability and validity testing steps. Subsection 6.4 presents the structural model of the relationships investigated in the present study. Finally, Subsection 6.5 compares the differences in structural models for marketing and R&D managers since previous research had found differences in responses for these two groups.

6.1 Data Preparation

Following the data collection step discussed in the previous section, data were first analysed and filtered using SPSS Statistics Version 21 and Microsoft Excel™ 2016 computer applications. These applications were chosen since they are available in many university laboratories and are suitable for analysis done in most types of social science research. The remainder of this subsection describes in detail the various data preparation steps.

Respondents

Respondents in the present study were consumer electronics industry marketing and R&D managers that have an active role in their organizations' product development processes. Based on the email addresses of the respondents who chose to identify themselves for the purposes of receiving research summaries or to be entered into a \$25 Starbucks gift card prize draw, it was determined that the respondents included individuals from large and well-known consumer

electronics organizations including, in no particular order, Samsung, GoPro, D-Link, Hewlett-Packard, Garmin, Bose, and Belkin. Table 12 summarizes the respondent characteristics.

Table 12: Descriptive summary of respondents.

Category	Breakdown	Number of Respondents	Percent Response
Respondents	Sent invites	1525	
	Completed responses	234	15%
	Unusable responses	28	2%
	Usable responses	206	13%
Location	Canada	3	1%
	USA	203	99%
Primary Job Type	Marketing	97	47%
	R&D	101	49%
	Other (Both Marketing and R&D)	8	4%
Time in Current Role	Less than 1 year	19	9%
	1 to 5 years	96	47%
	6 to 10 years	56	27%
	More than 10 years	35	17%
	Don't Know/Not Sure	0	0%
Organizational Size	Less than 100 employees	0	0%
	100 to 499 employees	43	21%
	500 to 999 employees	51	25%
	1000 or more employees	112	54%
	Don't Know/Not Sure	0	0

In total, 1525 surveys were emailed out to marketing and R&D managers in the North American consumer electronics industry. Out of the 234 responses that were returned, 206 were returned fully completed thus resulting in an approximately 13% response rate. This response rate is lower than previous studies focusing on marketing orientation and interdepartmental integration. For reference, response rates in Kahn's studies ranged from 8 to 30%. However, as was stated previously, the present study used an online survey methodology which typically has lower response rates than is found in the older studies that most frequently employed paper-based surveys or telephone interviews. Anecdotally, one respondent stated that they would prefer to use their personal email to complete the survey rather than their work email due to company Internet security policy which prohibited employees from accessing online surveys. This is not an unexpected finding given that this survey was administered during a period of increased cyber-attacks, many of which were well-publicized in the media (Johnson, 2017; Petroff, 2017).

The majority (99%) of the respondents were from the United States. Although the present study initially attempted to capture a representative proportion of Canadian organizations, this was ultimately not feasible given that the majority of consumer electronics organizations are located in the United States. This is very much a consequence of the specific industry that was researched in the present study. Out of 1525 invites that were sent, an *ex post* analysis indicated that 1475 (97%) invites were sent to managers in the United States and the remaining 50 (3%) were sent to Canadian managers. Therefore, the obtained distribution of responses between USA and Canadian managers is similar to the distribution of sent invites, which indicates that response rates between USA and Canada were comparable.

Despite not using quotas to balance the number of responses from marketing and R&D managers, a relative balance was achieved since 47% of respondents were marketing managers, 49% were R&D managers, and 8% identified their current role as having aspects of both marketing and R&D. The most common response for the time in the current role was “1 to 5 years” with 47% respondents. Other responses included 9% (less than 1 year), 17% (more than 10 years) and 27% (6 to 10 years).

With respect to organizational size, the most frequent responses were from very large organizations with “1000 or more employees” (54%). The distribution between medium-sized organizations with “100 to 499 employees” and large organizations with “500 to 999 employees” was comparable at 21% and 25%, respectively. No organizations had less than 100 employees since the survey automatically disqualified respondents who selected the “1 to 99 employees” option. Recall that this study controlled for small organizations that might not have well-defined marketing and R&D functions or departments.

Screening

The initial screening of the data was performed in Microsoft Excel™ 2016. The first form of screening was done to verify that the respondents were engaged during the survey and that they provided quality answers. This was verified in several different ways: Once it was known that the median time to complete the survey was approximately 8 minutes, all surveys that were completed in less than 3 minutes (approximately 1/3 median) were discarded since it was unlikely that respondents could adequately read the questions and provide reasoned responses in such a short period of time. In total, 6 completed surveys were rejected due to overly fast

completion time. Next, the standard deviation was used to identify straight-lined responses where respondents chose a single value for all the answers. Questionnaires with very low standard deviations (close to 0) for all the questions were suspected of straight-lining, or more technically, non-differentiated ratings. However, no cases of answer straight-lining were identified visually, and this was subsequently confirmed by noting that standard deviations were comparable for all respondents.

The second purpose of data screening in social science research is to ensure that responses were correctly coded. However, since the survey was administered online, the author was able to import the survey responses directly into Excel thus eliminating major coding errors that could occur with manual transcribing. Excel was also used to identify missing values (coded as -99) and to perform the preliminary descriptive statistical summary of data. Any survey questionnaire that had more than one missing response in a single construct was completely eliminated from the analysis. Although this was a very conservative approach that contributed to the elimination of 22 completed surveys, it ensured that each variable was measured on at least three user-generated responses. Moreover, questionnaires that had missing measurement items almost always had multiple missing values, thus including them in the analysis would have led to serious methodologies issues.

The third and most important purpose of data screening in social science is to deal with missing values in responses. This step was performed in SPSS Statistics since it was done automatically on the missing values identified in the previous step. Based on the literature review of suggested procedures for dealing with missing values, it was decided that imputing the median

values of the variable where the missing data are occurring is a reasonable substitute for missing values (Acuna & Rodriguez, 2004; Kline, 2005). The only requirement of this approach is that no more than 15% of the values are missing (Acuna & Rodriguez, 2004). In total, 1% missing values were replaced with the median value for the corresponding variable since this study used interval scales. Overall, missing values are unlikely to impact on the interpretation of the results.

Outliers and Influencers

Outlier values are those response values that rest outside of the normal range of all response values. The primary issue with outliers in the data is that they introduce errors with respect to the sample mean. This issue is particularly troublesome when sample sizes are small because the presence of even a small number of extreme outlier values can have a large impact on the sample mean. The impact of outliers on the data was analysed in SPSS Statistics using the Mahalanobis distance statistic using a chi-square test whereby values that are statistically different from the critical chi-square value indicate outliers (Kline, 2005). Mahalanobis distances with chi-square values that are less than 0.001 indicate outliers at $p < 0.001$ level (very significant). Ultimately, 5 responses had test statistics that were less than 0.001 and were thus removed from the subsequent analysis because they were deemed to be outliers. Complete details of all Mahalanobis distance statistics including chi-square values are presented in Table 34 in Appendix I. Responses that were removed from the subsequent analysis are shaded in the table.

In addition to examining for the presence of outliers, some researchers have also proposed checking if any specific responses are influencing the results by having a disproportionately

large effect on the response variables. These responses are called influencers or more accurately, “high leverage observations” (Chatterjee & Hadi, 1986). The suggested approach to check for influencers is to calculate Cook’s distance. Cook’s distance values above 1.0 are said to exert a disproportionately large influence. Responses with Cook’s distance was checked on the 198 responses that remained after the 5 outliers were removed in the previous step. The largest single value for Cook’s distance was less than 0.4, thus it was deemed that there were no influencers present in the data. However, it is possible that any influencers in the original data set were also the outliers that were removed in the previous step.

Normality

Normality of data is a prerequisite for covariance-based modelling of latent variables. Normality of response data was verified through an examination of skewness (asymmetry) and kurtosis (amount of responses in the tail portion of a distribution which represent outliers) of the data in SPSS Statistics. Although there are no authoritative guidelines for interpreting skewness and kurtosis statistics, some authors propose that skewness statistics for normally distributed data should range from -2 to 2 and kurtosis statistics should range from -3 to 3 (Byrne, 2001; Curran, West, & Finch, 1996). These values are comparable to those proposed in contemporary social science research. Consequently, the present study assumed that skewness values greater than ± 2 and kurtosis values greater than ± 3 should be considered as non-normal.

Table 13 summarizes the normality response statics. As can be observed, the most significant deviation occurs for the customer orientation indicators. This is a surprising finding given that this construct was measured using previously developed indicators from well-cited

marketing studies. In the case of the present study, it appears that the respondents had a predominantly positive opinion of their customer orientation thus leading to a negatively (right) skewed distribution. The result of this test shows that one indicator of customer orientation (CO2) and one indicator of cross-functional integration (CFI4) had skewness and kurtosis statistics that were outside of the expected values for normally distributed data. Nevertheless, it was decided that indicators CO2 and CFI4 should be retained in the measurement model but noted as potential candidates for removal from the subsequent analysis if they continue to present problems. Fortunately, the removal of one indicator for a construct is not a major problem for analysis, as long as there are at least three remaining indicators present (Jarvis, MacKenzie, & Podsakoff, 2003). Normality statistics for the remaining indicators shown in Table 13 were well within the suggested ranges for skewness and kurtosis.

Table 13: SPSS output of descriptive statistics and normality tests of measurement items.

Item	Minimum	Maximum	Mean	Standard Deviation	Skewness Statistic	Kurtosis Statistic
CO1	1	5	4.44	.846	-1.267	1.381
CO2	1	5	4.65	.738	-2.033	4.357
CO3	1	5	4.41	.842	-1.058	.493
CO4	1	5	4.15	.916	-.497	-.701
CFI1	1	5	4.19	.875	-1.308	2.033
CFI2	1	5	4.08	1.034	-1.137	.609
CFI3	1	5	4.19	.863	-1.151	1.412
CFI4	1	5	4.32	.840	-1.645	3.416
UOPFO1	1	5	3.78	1.054	-.879	.406
UOPFO2	1	5	3.86	1.091	-.857	.043
UOPFO3	1	5	3.76	1.137	-.799	-.045
UOPFO4	1	5	3.82	1.085	-.866	.143
UOPFO5	1	5	3.56	1.150	-.514	-.520
PRCS1	1	5	3.51	1.186	-.282	-.797
PRCS2	1	5	3.85	.938	-.541	-.024
PRCS3	1	5	3.93	.977	-.721	.149
PRCS4	1	5	3.95	1.101	-.827	-.125
PRDS1	1	5	4.19	.879	-1.191	1.631
PRDS2	1	5	3.95	.960	-.730	.266
PRDS3	1	5	4.10	.843	-.707	.175
PRDS4	2	5	4.27	.785	-.841	.092

Non-response Bias

Non-response bias refers to the potential difference in responses between those individuals in the target sample that provide responses and those that do not (Bryman & Bell, 2011). The usual procedure for assessing non-response bias is to compare the differences in responses between early and late respondents, under the assumption that late respondents are an adequate estimator of non-respondents (Armstrong & Overton, 1977). Summary statistics for the two groups are presented in Table 14. The difference in responses for each variable between the first group of respondents (April 25 to June 25) and the second group (June 26 to July 15) who responded following a reminder email was compared using Levene's test for the equality of variances and student t-test procedures. As the results of these tests show in Table 15, no significant differences were observed between the two groups of respondents, thus indicating that non-response bias was not a problem in this study.

Table 14: Summary of early and late respondent statistics.

Variable	Period	N	Mean	Std. Deviation	Std. Error Mean
CO	Early	132	4.501	.746	.065
	Late	66	4.477	.715	.088
CFI	Early	132	4.208	.817	.071
	Late	66	4.280	.734	.090
UOPFO	Early	132	3.752	1.115	.097
	Late	66	3.894	.979	.120
PRCS	Early	132	3.839	.883	.077
	Late	66	3.924	.851	.105
PRDS	Early	132	4.163	.748	.065
	Late	66	4.227	.740	.091

Table 15: Levene's and student t-test comparisons of early and late respondents.

Variable		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
CO	Equal variances assumed	.007	.932	.211	196	.833	.023	.111	-.195	.242
	Equal variances not assumed			.214	135.22	.831	.023	.109	-.193	.240
CFI	Equal variances assumed	.592	.443	-.604	196	.547	-.072	.119	-.307	.163
	Equal variances not assumed			-.626	143.18	.533	-.072	.115	-.299	.155
UOPFO	Equal variances assumed	1.853	.175	-.882	196	.379	-.142	.162	-.461	.176
	Equal variances not assumed			-.921	146.16	.359	-.142	.155	-.448	.163
PRCS	Equal variances assumed	.062	.803	-.648	196	.518	-.085	.132	-.345	.174
	Equal variances not assumed			-.655	134.42	.513	-.085	.130	-.342	.172
PRDS	Equal variances assumed	.231	.631	-.573	196	.567	-.064	.112	-.286	.157
	Equal variances not assumed			-.575	131.33	.566	-.064	.112	-.286	.157

Common Method Variance

Common method variance (bias) is caused by the measurement instrument itself and not due to correlations between variables (Chang, Van Witteloostuijn, & Eden, 2010; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Specifically, common method variance results in a correlation between variables that is the result of the method used and not the nature of the variables themselves. This possibility was stated in many of the prior studies listed in Table 9. However, this potential bias was minimized *ex ante* in the present study given that the respondents were holding management-level positions and had intimate knowledge of the subject matter (Mitchell, 1994). Furthermore, Podsakoff et al. (2003) argue that this bias can be further reduced in research through the use of carefully constructed measures that separate predictor and criterion variables within the survey instrument. The present study used multiple well-established predictor and criterion variables from previous studies, therefore reducing the potential impact of common method bias. Finally, this study collected responses using an electronic survey with randomized question ordering that is a well-established approach to data collection in contemporary social-science studies.

One method of testing for common method variance *ex post* is Harman's Single Factor Test. Harman's test is performed in the Exploratory Factor Analysis (EFA) whereby common method variance is suspected if all the measurement items load significantly onto a single factor. When EFA was performed in the present study, the unrotated single factor solution only accounted for 37% of the variance, thus indicating that common method variance was not a problem. A more robust method for testing whether a single factor accounts for the majority of the variance in the variables is the confirmatory factor analysis (CFA). CFA provides several

goodness-of-fit tests that are used to judge how well the proposed measurement model fits the data. A detailed presentation of CFA statistics is provided in the next subsection.

6.2 Measurement Model Unidimensionality

Since the present study is using latent variables that cannot be observed directly, it is critical that the measurement model is tested to ensure that the measurement items (questions) are accurately measuring those constructs that they were expected to measure. This consideration is referred to unidimensionality. Unidimensionality is typically tested using EFA and CFA which are discussed next.

Exploratory Factor Analysis

EFA was performed in SPSS Statistics using the principal component analysis method (PCA) with varimax rotation. In general, unidimensionality is confirmed if the eigenvalue for each measurement item is greater than 0.40. EFA is designed to test whether items for newly developed scales load strongly onto a single variable (factor). Since the items used for UOPFO were developed specifically for the present study, it was decided that using EFA was a good starting point before moving into more complex analyses. Table 16 shows that the five items measuring UOPFO were all loading strongly onto a single factor, as is evidenced by item loadings being above 0.8. Moreover, Table 17 shows that the one factor solution explained 72.434% of the variance in the UOPFO variable, thus further supporting unidimensionality.

Table 16: Component matrix for UOPFO EFA.

Item	Component 1
UOPFO1	.881
UOPFO2	.830
UOPFO3	.861
UOPFO4	.867
UOPFO5	.815

Extraction Method: Principal Component Analysis.

Table 17: UOPFO EFA total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.622	72.434	72.434	3.622	72.434	72.434
2	.417	8.342	80.776			
3	.388	7.750	88.526			
4	.303	6.058	94.584			
5	.271	5.416	100.000			

Extraction Method: Principal Component Analysis.

Interestingly, once EFA was rerun with measurement items for all 5 constructs, PRCS4 item was loading more strongly on product success (component 2) rather than on process success (component 5) (Table 18). This item measured whether the product development process was innovative, but some ambiguity remains in the literature whether innovation is a measure of a successful process or the outcome. This finding could explain why this item loads on both

product development success dimensions. Consequently, item PRCS4 was removed from the subsequent analysis since it would likely present problems with measurement scale reliabilities and validities.

Table 18: Exploratory Factor Analysis rotated component matrix.

Item	Component				
	1	2	3	4	5
CO1			.831		
CO2			.893		
CO3			.812		
CO4			.578		
CFI1				.799	
CFI2				.704	
CFI3				.671	
CFI4				.701	
UOPFO1	.852				
UOPFO2	.780				
UOPFO3	.844				
UOPFO4	.847				
UOPFO5	.742				
PRCS1					.617
PRCS2					.791
PRCS3					.613
PRCS4		.585			
PRDS1		.721			
PRDS2		.643			
PRDS3		.832			
PRDS4		.721			

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 5 iterations.

Confirmatory Factor Analysis

Unidimensionality can also be verified using CFA which is a more robust method for assessing the loadings between measurement items and latent variables. CFA was performed in SPSS AMOS Version 24 and is used to test the fit of the measurement model presented in Figure 7. The primary difficulty with performing CFA is that it requires a relatively large number of responses. Although there is no firm consensus on the minimum acceptable number of responses, many researchers have used an approximate target of 200 responses or 10 responses / variable in order to meet many of the typically proposed guidelines (Kline, 2005; Wolf, Harrington, Clark, & Miller, 2013). The reason for having a minimum number of responses for SEM is that increasing the sample size reduces the standard error of the calculated means, which ultimately increases the precision of statistical tests. Complex covariance-based SEM with many constructs, as is the case in the present study, thus requires a large number of responses in order to determine with precision the significance of the relationships between the constructs. Nevertheless, Monte Carlo studies have suggested a more modest sample size stating that it “should exceed 100 observations regardless of other data characteristics to avoid problematic solution and obtain acceptable fit concurrently” (Nasser & Wisenbaker, 2003, p. 754). The second requirement of CFA is that all the indicators are normally distributed. This requirement was verified and addressed in the previous subsection.

CFA is typically verified using multiple goodness-of-fit indices such as the comparative fit index (CFI), root mean square error approximation (RMSEA), Tucker-Lewis Index (TLI) which is also referred to as non-normed fit index (NNFI), and standardized root mean square residual (SRMR). Note that contemporary research suggests avoiding some previously popular

indices such as the normed fit index (NFI) and goodness-of-fit index (GFI) since they are affected by the number of parameters and responses (Sharma, Mukherjee, Kumar, & Dillon, 2005). Use of multiple indices to verify unidimensionality is preferable to only using a single index since prior literature has identified comparative strengths and weakness of each index (Kline, 2005).

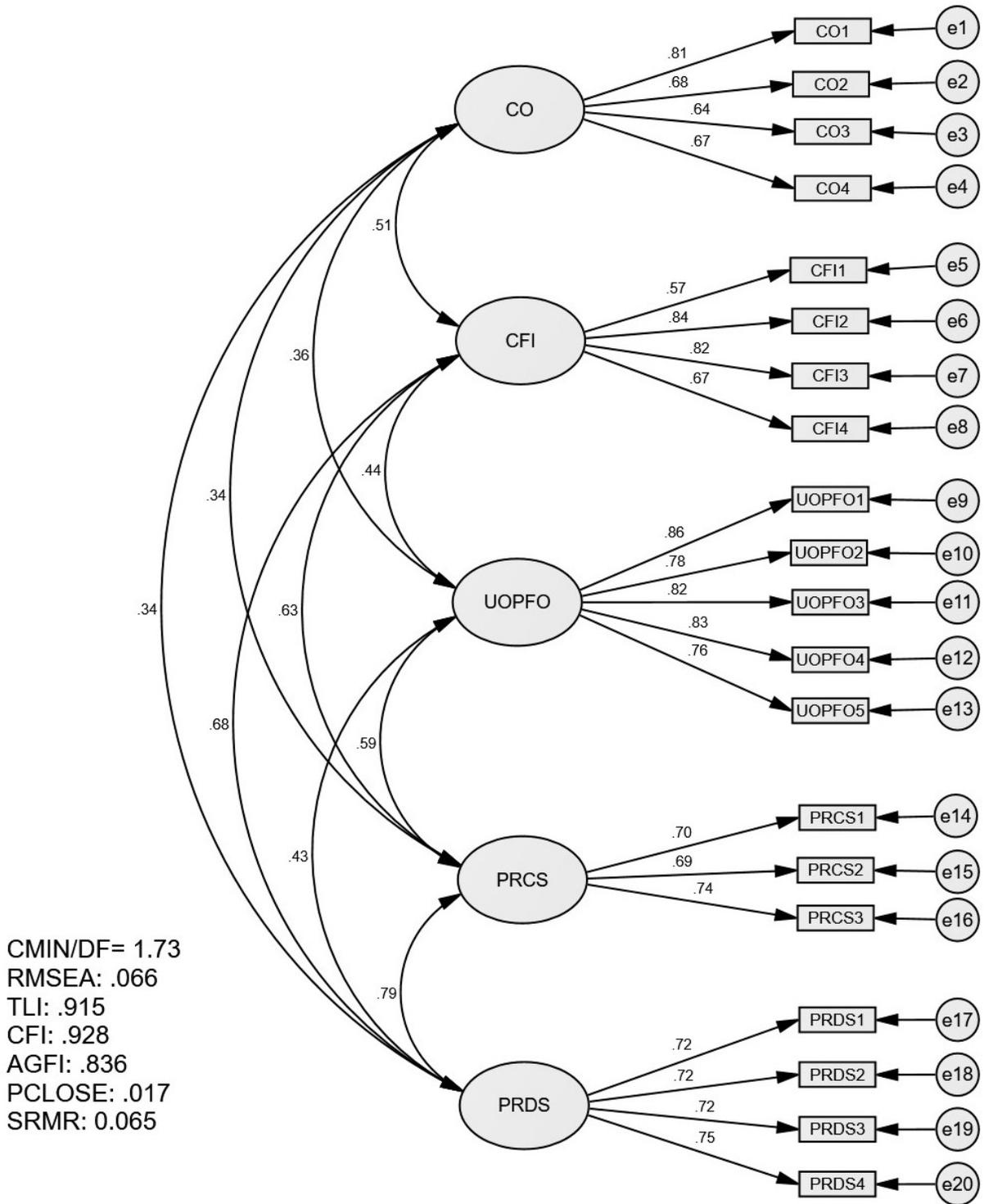


Figure 7: SPSS AMOS output for CFA of the complete measurement model.

Table 19 provides a listing of the cut-off values for these indices which indicate the generally accepted values for exploratory social science research. Note that these cut-off values are provided as recommendations since they do not immediately confirm or disprove the validity of proposed models (Hayduk, Cummings, Boadu, Pazderka-Robinson, & Boulianne, 2007). As can be observed, almost all goodness-of-fit measures for the overall measurement model are within the suggested cut-off values, thus supporting the measurement model fit. The only exception was the pClose (probability of close fit) index value which was lower than the recommended cut-off. However, this particular test is sensitive to samples size and degrees of freedom, which could have impacted the results (Sharma et al., 2005). Moreover, pClose index values are only considered to indicate a “very poor” model fit if they are less than 0.01. Overall, these indices demonstrate that the measurement items are loading well on their respective factors.

Table 19: Goodness-of-fit values for the overall measurement model.

Index	Cut-off Value	Observed Value
CFI	> 0.90	0.928
TLI	> 0.90	0.918
AGFI	> 0.80	0.836
RMSEA	< 0.10	0.066
pClose	> 0.05	0.017
SRMR	< 0.08	0.065

In addition to confirming the unidimensionality of the overall model, the same approach was applied to test the unidimensionality of each individual construct. This second approach is particularly useful as a diagnostic tool when the overall model indicates problems with unidimensionality. Goodness-of-fit values for each construct are provided in Table 20. As can be observed from Figures 8 to 12, there is support for the measurement models of all individual constructs based on the goodness-of-fit values. Additionally, the measurement items load well on their respective constructs as is evidenced by all individual loadings being above 0.6 or the average loadings above 0.7 (MacCallum, Widaman, Preacher, & Hong, 2001).

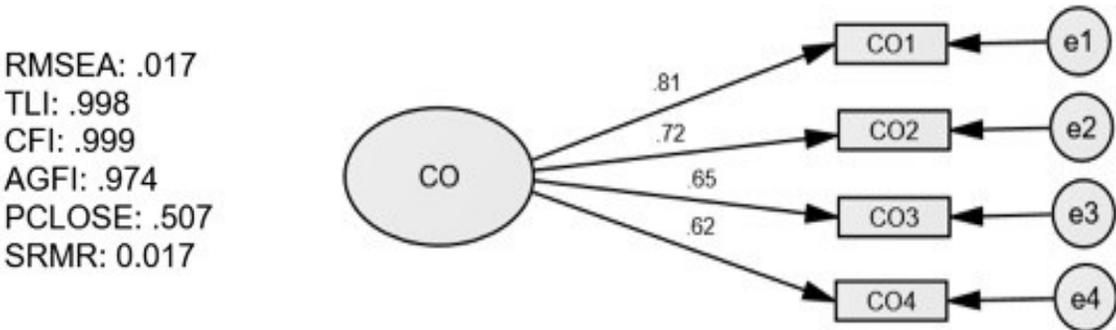


Figure 8: CFA item loadings and goodness-of-fit statistics for the CO construct.

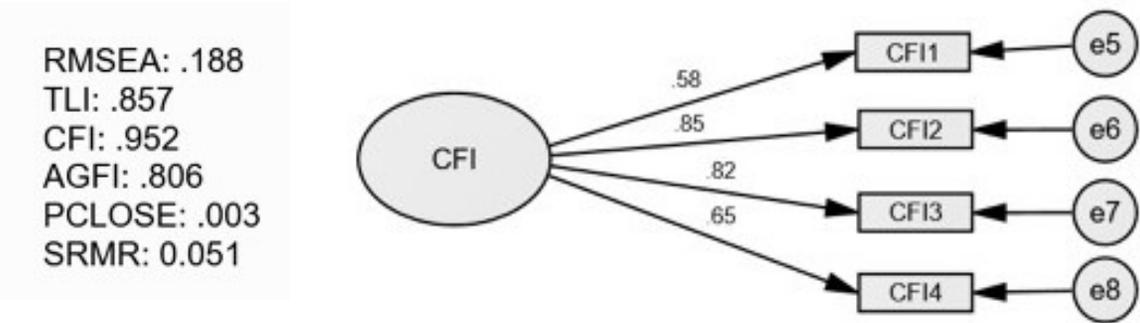


Figure 9: CFA item loadings and goodness-of-fit statistics for the CFI construct.

RMSEA: .000
 TLI: 1.000
 CFI: 1.000
 AGFI: .988
 PCLOSE: .946
 SRMR: 0.010

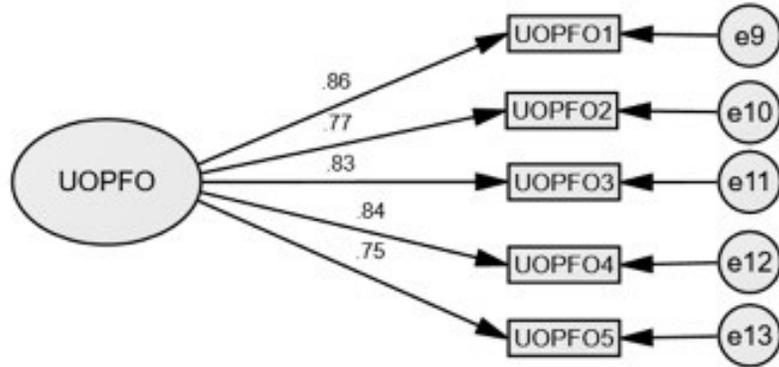


Figure 10: CFA item loadings and goodness-of-fit statistics for the UOPFO construct.

RMSEA: .000
 TLI: 1.000
 CFI: 1.000
 AGFI: .995
 PCLOSE: .894
 SRMR: 0.001

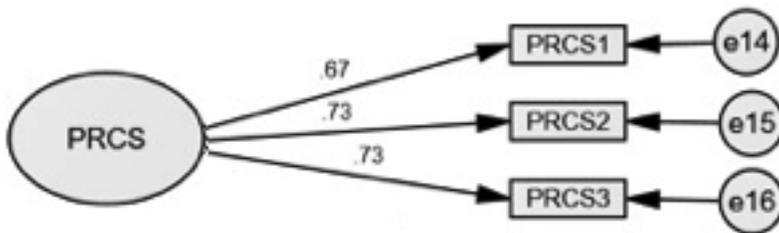


Figure 11: CFA item loadings and goodness-of-fit statistics for the PRCS construct.

RMSEA: .078
 TLI: .972
 CFI: .991
 AGFI: .947
 PCLOSE: .232
 SRMR: 0.022

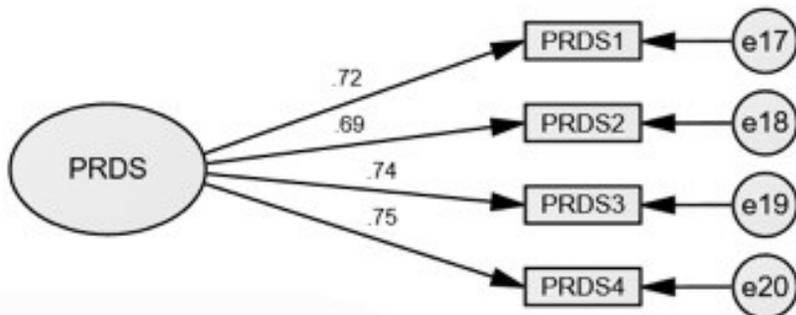


Figure 12: CFA item loadings and goodness-of-fit statistics for the PRDS construct.

Table 20: Goodness-of-fit values for the individual measurement models.

Index	Cut-off Value	Observed Value				
		CO	CFI	UOPFO	PRCS	PRDS
CFI	> 0.90	0.999	0.952	1.000	1.000	0.991
TLI	> 0.90	0.998	0.857	1.000	1.000	0.972
AGFI	> 0.80	0.974	0.806	0.988	0.995	0.947
RMSEA	< 0.10	0.017	0.188	0.000	0.000	0.078
pClose	> 0.05	0.507	0.003	0.010	0.894	0.232
SRMR	< 0.08	0.017	0.051	0.010	0.001	0.022

6.3 Measurement Model Reliability and Validity

The previous subsection demonstrated the unidimensionality of the measurement model with respect to measurement scales. Measurement models also have to demonstrate reliability and validity in order to ensure that the relationships between variables can be modelled

accurately (Ping, 2004). This section presents the reliability and validity testing of the measurement model.

Reliability

Reliability refers to an instrument's ability to provide consistent measures over time. In more technical terms, Kline (2005) states that a reliable measurement instrument should be free of random measurement error. Reliability of measures, also known as "internal consistency", was first verified in the present study using Cronbach alpha, in accordance with Nunnally, Bernstein and Berge (1967) guidelines. Specifically, Nunnally *et al.* state that alpha values above 0.7 are acceptable for exploratory research. Use of Cronbach alpha became almost universally adopted by management researchers due to inherent limitations and complexities of other reliability measures such as the test-retest and split-half test methods (Deng & Dart, 1994). Nevertheless, contemporary research has begun supplanting Cronbach's alpha with composite reliability (CR), because CR is calculated using both the measurement errors and standardized loading for each item, which reduces the underestimation of reliability. CR values above 0.7 are deemed to indicate acceptable reliability (Hancock & Mueller, 2001). Table 22 shows that both Cronbach's alpha and CR values for all variables were above 0.7, thus supporting the reliability of measures.

Table 21: Cronbach's alpha and convergent reliability values.

Variable	Cut-off Value	Cronbach's Alpha	Composite Reliability
CO	> 0.7	0.754	0.795
CFI	> 0.7	0.820	0.821
UOPFO	> 0.7	0.904	0.905
PRCS	> 0.7	0.745	0.753
PRDS	> 0.7	0.813	0.816

Validity

Validity tests whether changes in an independent variable are truly responsible for changes in the corresponding dependent variable. Validity was evaluated in the present study using content and construct (convergent and discriminant) validity. Content validity is explained as "the systematic examination of the test content to determine whether it covers a representative sample of the behavior domain to be measured" (Anastasi & Urbina, 1997, p. 114). Models have content validity if the measures are able to assess all of the dimensions of a construct. Although it is difficult to confirm content validity, the present study has employed well-developed constructs from the literature and has employed operationalized measures whenever possible. This approach supports content validity since it decreases the possibility that the measurement items are not measuring the entire construct. Content validity was also demonstrated by pre-testing all of the measurement items with academics and experts in related fields of study (Judd,

Smith, & Kidder, 1991). This process confirmed that all of the measurement items used in the present study were measuring their intended underlying concepts.

Construct validity is generally easier to confirm than content validity since it is based on objective measures and guidelines. Measures are said to have construct validity if they measure the theoretical constructs that they were designed to measure (Deng & Dart, 1994). Nevertheless, as was stated previously, all objective tests of validity need to remain theoretically and logically feasible. Construct validity consists of convergent and divergent validity. Convergent validity is the first type of construct validity and it investigates the degree to which the measurement items for a single construct are all measuring that specific construct. Convergent validity is present when the average variance extracted (AVE) is above 0.5 (Hair, Black, Babin, & Anderson, 2009). AVE values are listed in Table 22 and are all above 0.5, thus supporting convergent validity. Convergent validity can also be demonstrated by examining the item loadings in Figure 7 that were calculated as part of the CFA. Individual item loadings above 0.6 or average loadings above 0.7 are evidence of convergent validity (MacCallum et al., 2001). Although the CFI1 item had a loading of 0.57, the value is close to the cut-off point and the average loading value for the four CFI items is 0.72, thus this loading is deemed to be acceptable.

Table 22: Convergent validity assessment.

Variable	AVE
CO	0.501
CFI	0.540
UOPFO	0.657
PRCS	0.504
PRDS	0.526

Discriminant validity, which is at times referred to as divergent validity, takes a different perspective from convergent validity since the intention of this test is to confirm that measurement items do not overlap with measurement items for other constructs. Discriminant validity is demonstrated if the square root of AVE value for a factor is greater than the correlation with all other factors (Fornell & Larcker, 1981; Hair et al., 2009). Table 23 displays the AVE, the square root AVE (bold value on the diagonal) and the inter-factor correlations. As can be observed from the table, discriminant validity was observed for CO, CFI, and UOPFO constructs. This was not the case for PRCS and PRDS constructs whose individual square root AVEs (0.710 and 0.725, respectively) were lower than their shared correlation of 0.785. This finding indicates that PRCS and PRDS share a noticeable amount of variance. Nevertheless, the difference between the values is small and it is not uncommon for empirical studies to show some deviation from theoretical suggestions (Hair et al., 2009).

Table 23: Correlation matrix and discriminant validity assessment.

Variable	AVE	CO	CFI	UOPFO	PRCS	PRDS
CO	0.500	0.707				
CFI	0.540	0.508	0.735			
UOPFO	0.657	0.357	0.435	0.811		
PRCS	0.504	0.344	0.634	0.587	0.710	
PRDS	0.526	0.342	0.677	0.432	0.786	0.725

6.4 Structural Model

Relationships between the variables were tested using structural equation modelling (SEM) in SPSS AMOS Version 24. SEM is a popular analysis technique in social science research since it combines the strengths of several first-generation multivariate methods: regression, path, and confirmatory factor analysis (Kline, 2005; Schumacker & Lomax, 2010). Most importantly, SEM allows for the simultaneous study of direct and indirect effects with multiple exogenous and endogenous variables (Crockett, 2012). SEM is also used to test models that incorporate linear relationships between latent variables. Therefore, the use of SEM was a particularly appropriate approach because the present study uses multiple latent variables with indirect effects. Based on these findings, the *a priori* model is shown in Figure 13. The final model, with only the significant relationships shown, is presented in Figure 14. All the relationships in the final model were significant at $p < 0.001$ level.

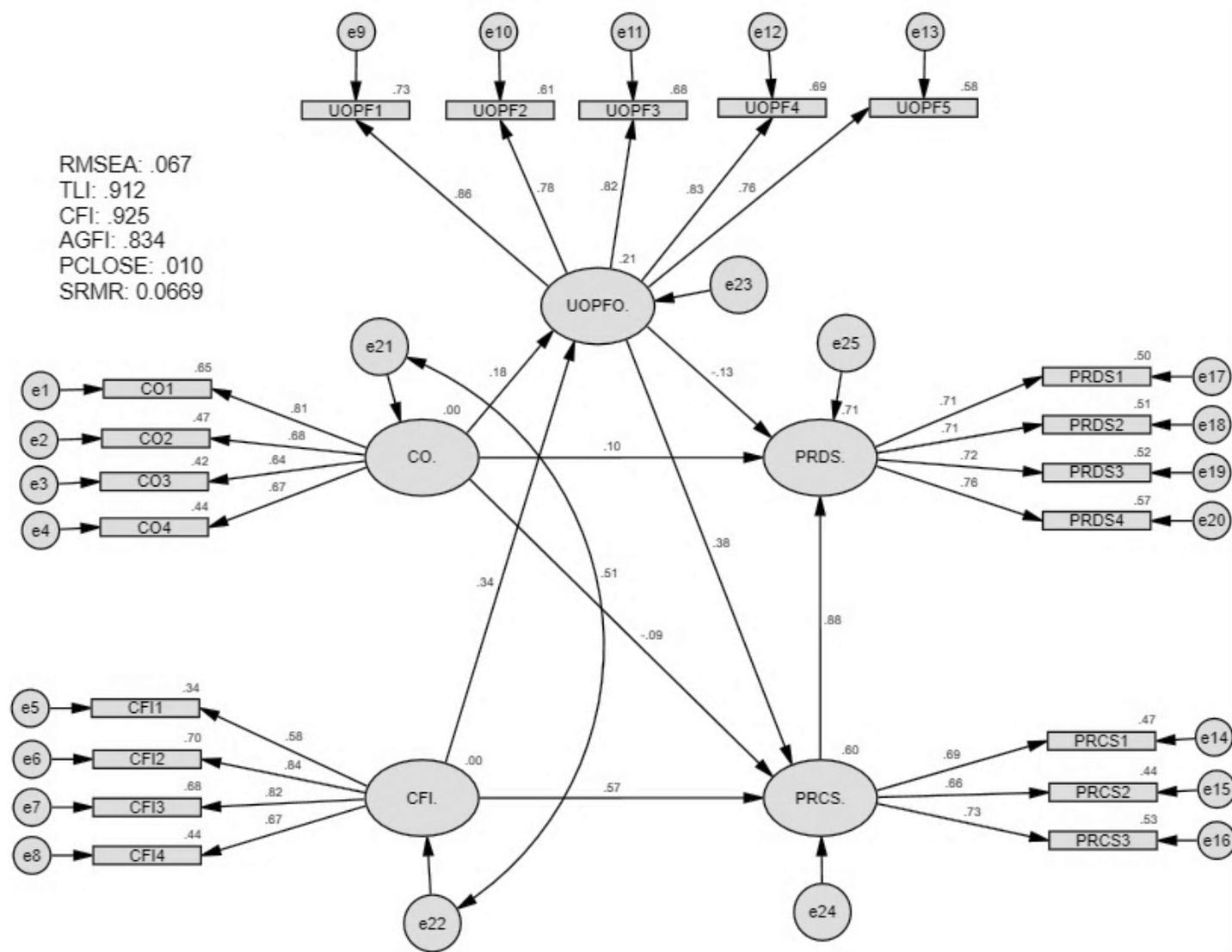


Figure 13: *A priori* structural model output from SPSS AMOS (n=198).

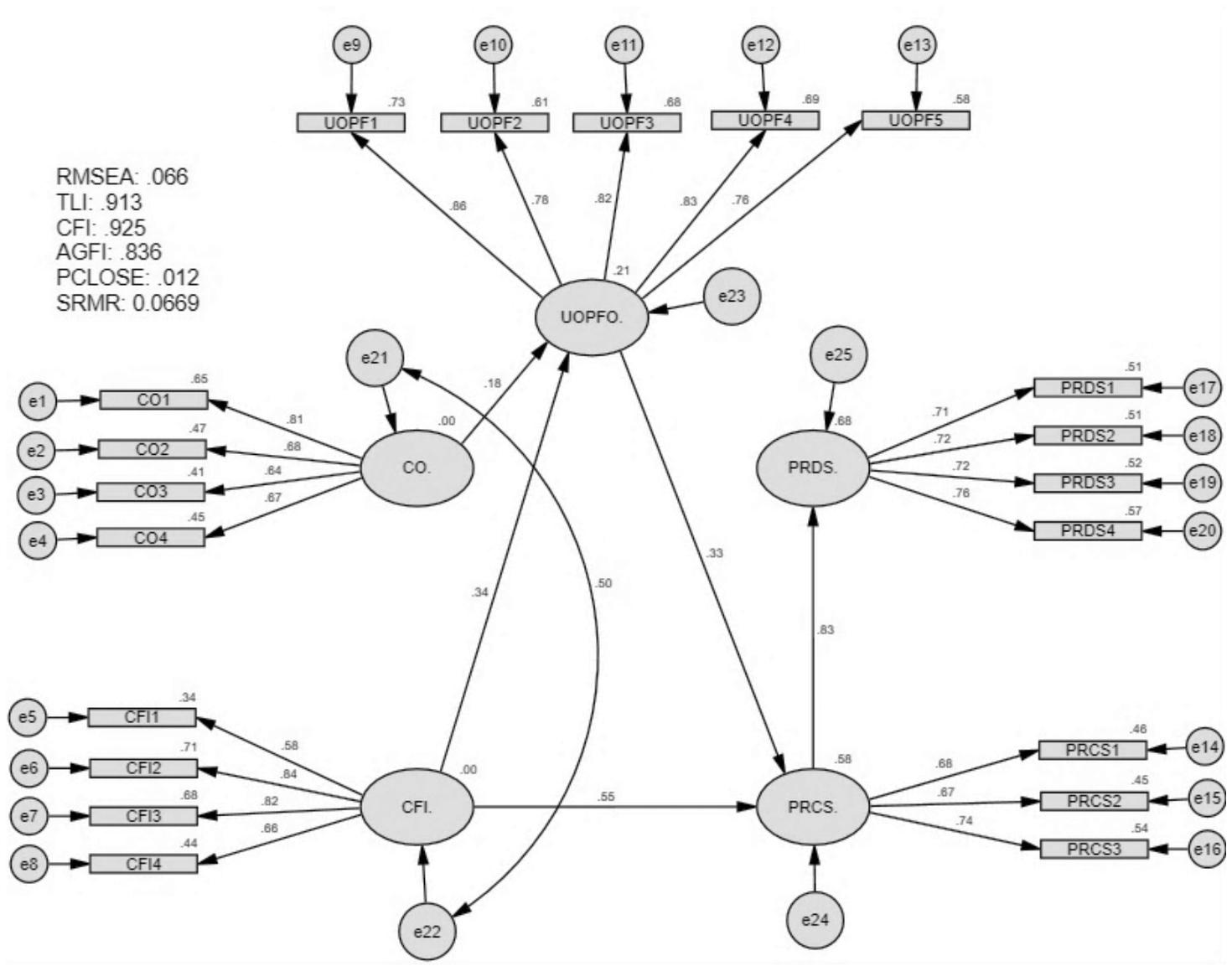


Figure 14: Final structural model output from SPSS AMOS (n=198).

Several frequently used goodness-of-fit statistics for the models shown in Figures 8 and 9 are provided in Table 24. It can be observed from the table that both the initial and final models had reasonable fit according to the cut-off points shown in the table. Nevertheless, a slightly better fit was achieved in the final model once non-significant relationships were removed from the model. Overall, these goodness-of-fit indices support the model proposed in this study. Only the pClose statistic was lower than the cut-off value, but this should not present a problem given that model fit was verified by several other goodness-of-fit statistics.

Table 24: Goodness-of-fit values for the initial and final models.

Index	Cut-off Value	<i>A Priori</i> Model	Final Model
CFI	> 0.90	0.925	0.925
TLI	> 0.90	0.912	0.913
AGFI	> 0.80	0.834	0.836
RMSEA	< 0.10	0.067	0.066
pClose	> 0.05	0.010	0.012
SRMR	< 0.08	0.067	0.069

6.5 Comparative Models

The most peculiar aspect of the final structural model presented above is that it did not show support for the relationship between customer orientation and product success. This relationship was found in several previous studies and was expected to occur again in the present study. In order to gain insight into this discrepancy, comparative models were developed each for marketing (Figure 15) and R&D (Figure 16) managers. One limitation of this approach is

that splitting the respondents into two groups lowered the number of marketing and R&D respondents to 93 and 97, respectively, which is lower than Kline (2005) recommendation of 100 responses per group. Nevertheless, as was stated previously, these sample sizes are recommendations rather than strict restrictions, thus the two groups tested in the presented study should be of sufficient size.

Configural, or pattern, invariance was confirmed for the two groups (goodness-of-fit indices were close to acceptable cut-off values) which indicates that there was a comparable pattern of free and fixed loadings between the two models. However, measurement invariance was not confirmed due to a significant Chi-square difference ($p = 0.17$) which indicates that there were differences in how the measurement scales measured the underlying constructs between the two groups. Consequently, comparative models for the two groups of managers were retested using the increasingly popular Partial Least Squares (PLS) variance-based SEM methodology that is less affected by sample sizes and non-normality of variables than covariance-based SEM that is performed in AMOS (Hair Jr, Hult, Ringle, & Sarstedt, 2016). As can be observed in Figure 17 and Figure 18, the PLS method has identified the same significant relationships for marketing and R&D manager models, thus supporting the findings obtained in AMOS. Note that the values inside of the ovals representing the constructs represent composite reliability.

Overall, customer orientation did have a direct positive effect on product success for marketing managers model, while it did not for R&D managers model. This finding is comparable to that of Kahn (2001) who also found that marketing and R&D managers have

different perceptions of the role of customer orientation. One explanation for this finding could be that marketing managers perceive customer orientation as having a role in developing customer relationships which have an impact on product success. Conversely, R&D managers' perceptions of customer orientation might be primarily as that of a marketing research function that collects feedback for the product development process but does not directly interest with customers. Table 25 summarizes the significant and non-significant relationships between the marketing and R&D manager comparative models.

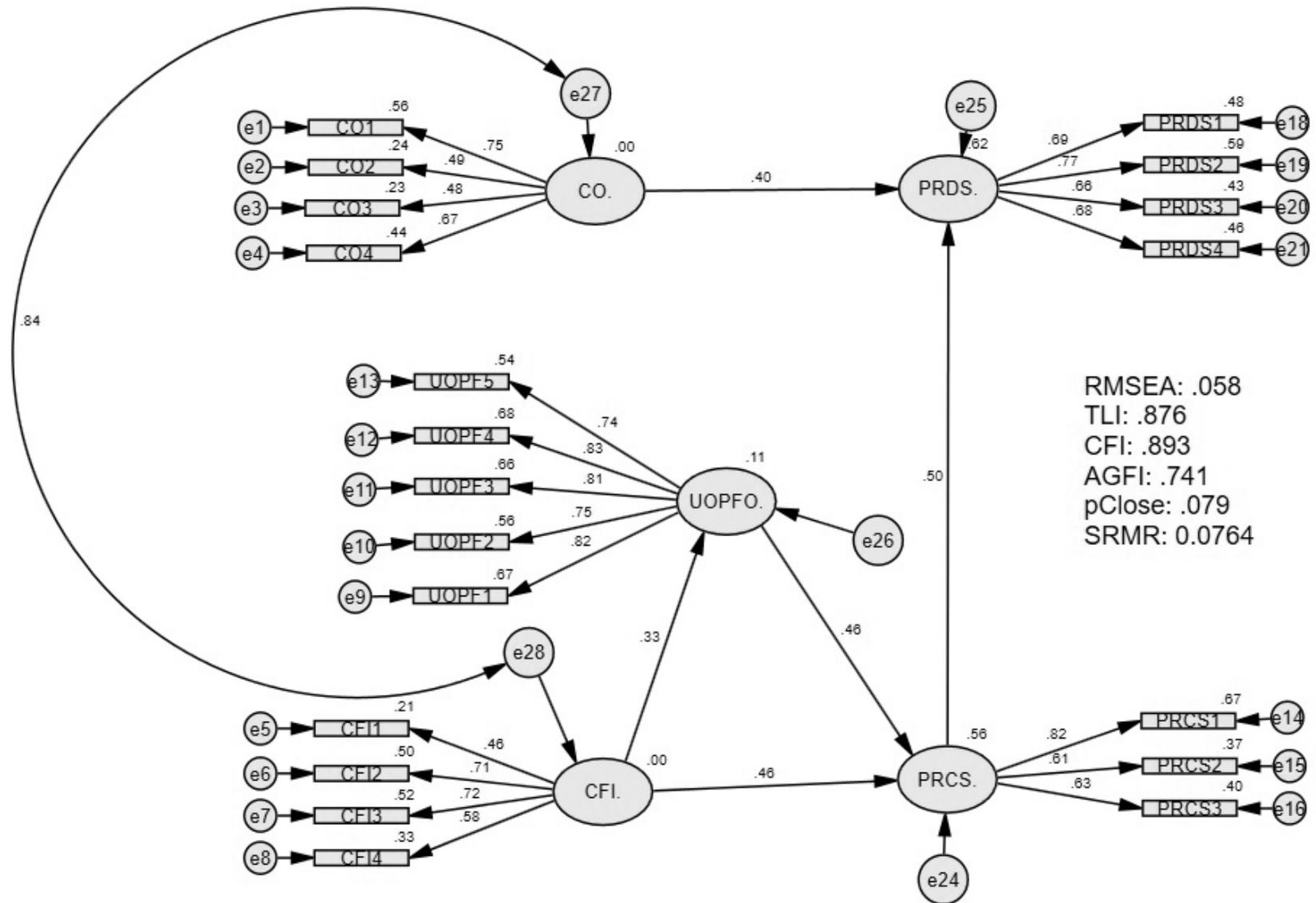


Figure 15: Structural model for marketing managers (n=93) in IBM AMOS.

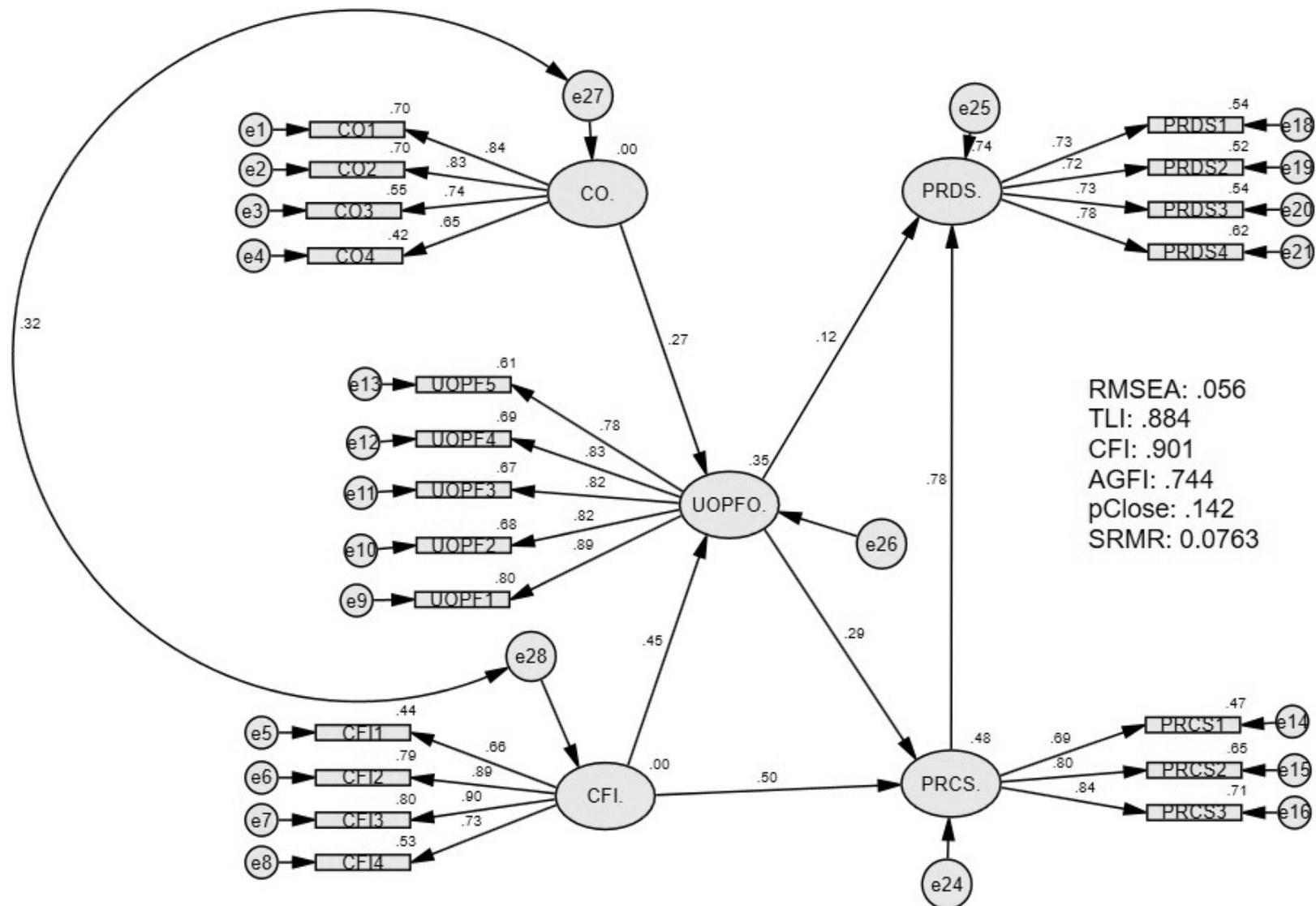


Figure 16: Structural model for R&D managers (n=97) in IBM AMOS.

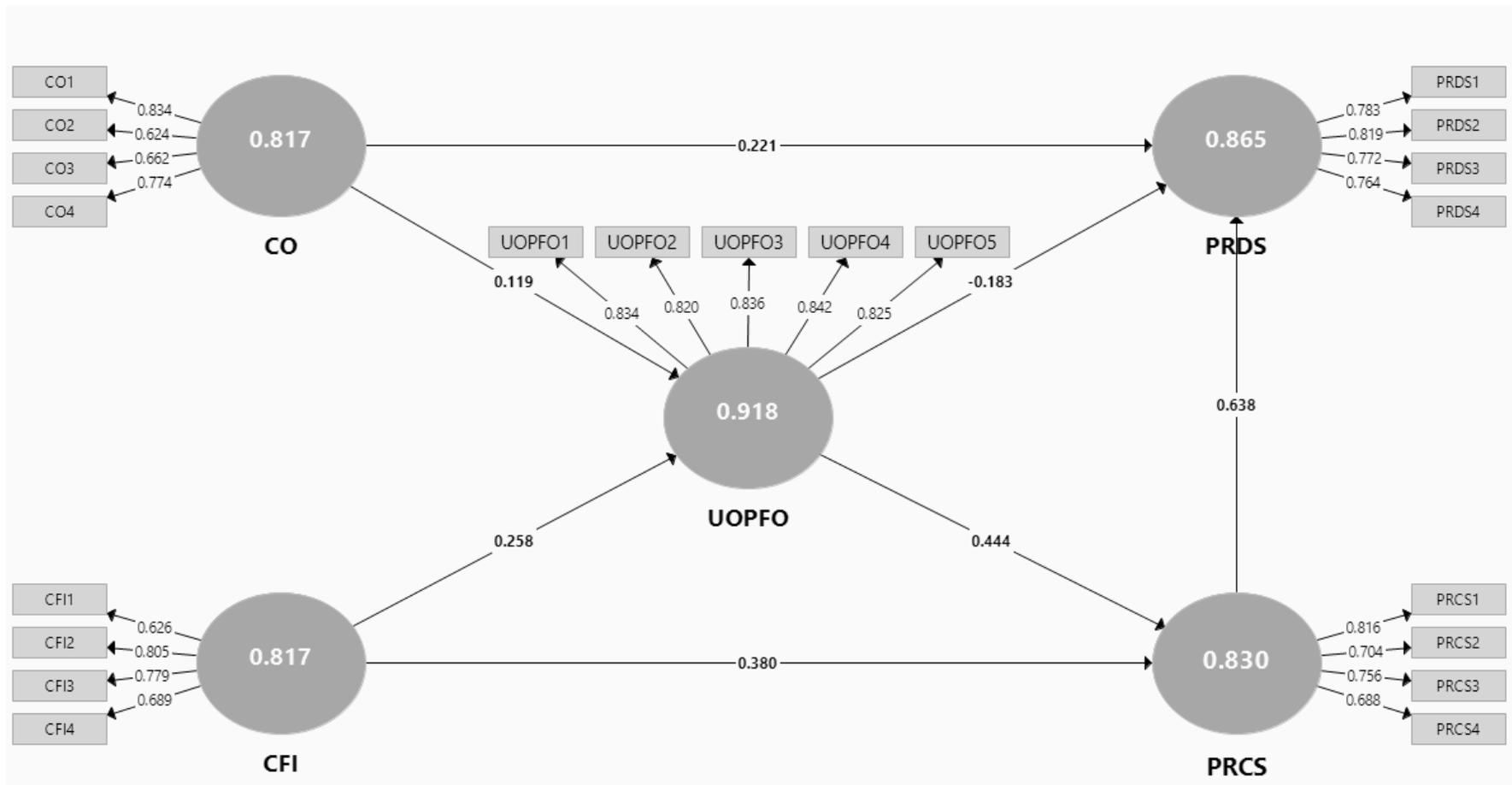


Figure 17: Structural model for marketing managers (n=93) tested in SmartPLS.

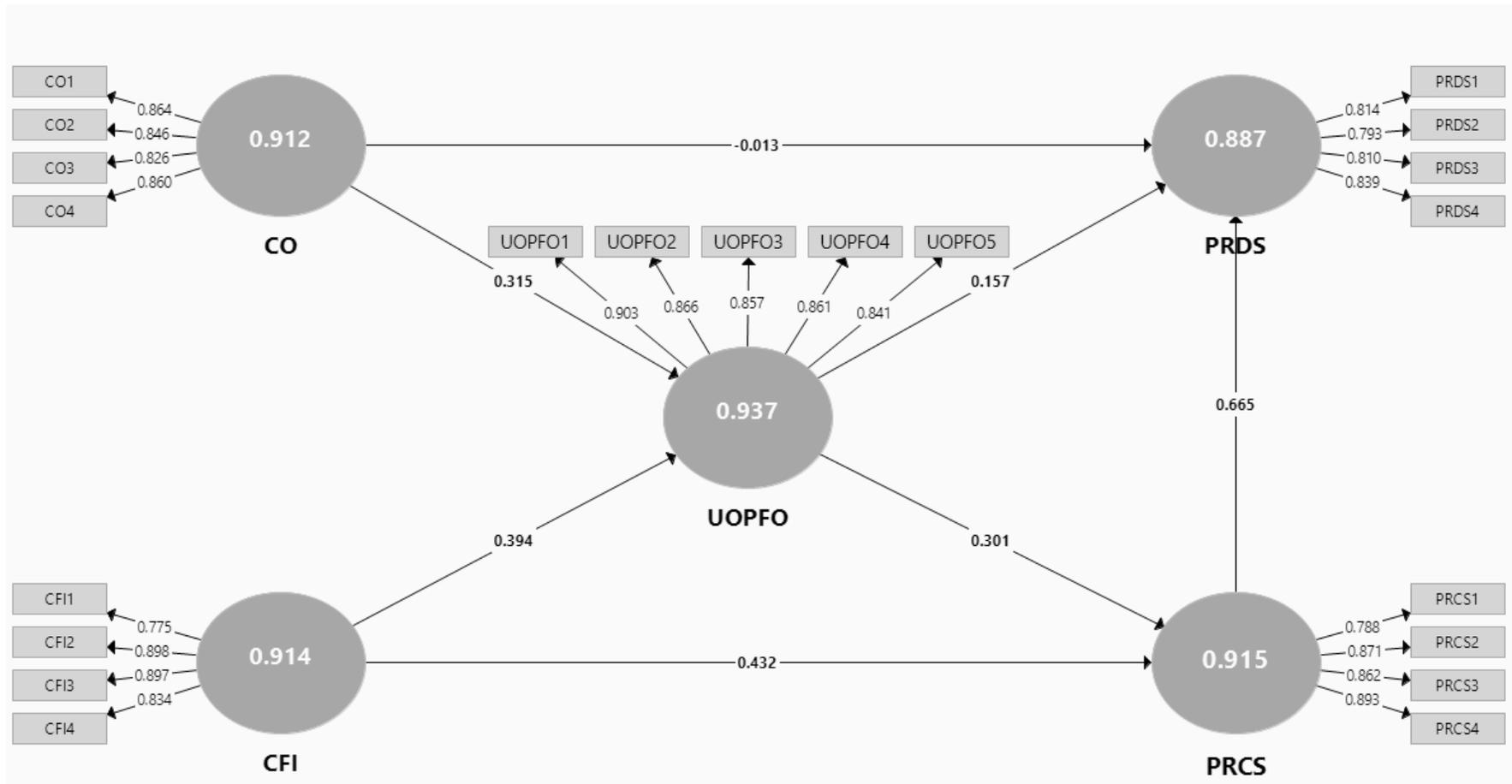


Figure 18: Structural model for R&D managers (n=97) tested in SmartPLS.

Table 25: Summary of significant relationships for marketing and R&D models.

Relationship Tested	Significant?	
	Marketing (n = 93)	R&D (n = 97)
CO → PRDS	YES	NO
CO → PRCS	NO	NO
CO → UOPFO	NO	YES
CFI → UOPFO	YES	YES
CFI → PRCS	YES	YES
UOPFO → PRDS	NO	YES
UOPFO → PRCS	YES	YES
PRCS → PRDS	YES	YES

7.0 RESULTS

This section discusses the key results obtained from the analysis presented in the previous section. In order to improve readability, the results have been divided into two subsections. Subsection 7.1 presents the results of descriptive statistics in order to answer the exploratory research questions that were developed in Section 3.0. Subsection 7.2 presents the results of hypothesis testing and explains how this impacts on the *a priori* model shown in Subsection 4.3

7.1 Descriptive Findings

Several interesting results were obtained based on the exploratory questions that were presented in Section 3.0. All statements indicating the superiority of one response over others in Tables 24 to 26 have been found to be significant at the $p < 0.05$ level using the Chi-square test-of-differences (Bryman & Cramer, 2011). To begin, recall that the survey participants were first asked about the benefits of UOPF integration that they expected to obtain and then about the benefits, if any, that they actually obtained. Table 26 summarizes the frequency of responses in regard to the expected benefits of using UOPF in product development. Table 27 shows the frequencies for observed benefits of using UOPF. The most frequently cited expected benefit (28%) was a “more accurate assessment of quality” ($p < 0.05$). The percentage decreased to 23% once the respondents were asked to identify the observed (obtained) benefits of UOPF. The most frequently cited observed benefits of UOPF were “access to additional ideas” (24%) followed very closely by a “greater variety of ideas” and a “more accurate assessment of quality” (23%). This finding matches the expectations stated at the beginning of this document in that respondents perceive UOPF as a valuable source of ideas for product development; both with

respect to quantity and variety. The least frequently selected expected and observed benefits were “data analysis process can be automated” and “cheaper than traditional methods”, respectively. Both of these choices were significantly less popular ($p < 0.005$) than the preceding three choices. This finding might be specific to the present study that has only surveyed large organizations with assumedly large marketing budgets. Smaller organizations with less than 100 employees that were not sampled in the present study might be more sensitive to using cost-effective sources of customer feedback. Respondents were also invited to provide their own benefits in the form of free-text responses. However, the 23 free-text responses were simply variations or elaborations of the five benefits that were proposed by the author. Although the free-text responses did not uncover additional benefits or themes, this finding provides support that the response options provided in the survey questionnaire were well-developed. Free-text responses on expected and observed benefits are provided in Appendix J.

In terms of the differences between marketing and R&D managers, there was a very close match between the two groups of respondents with respect to the expected benefits of UOPF. More pronounced differences were observed for the obtained benefits of UOPF. Marketing managers indicated significantly more often than R&D managers that a “more accurate assessment of quality” and “cost savings versus traditional methods” as an obtained benefit. In contrast, R&D managers indicated significantly more often that they obtained benefits pertaining to the “ability to automate the data analysis of UOPF”. Although not significantly different, marketing managers stated more often that a “more accurate assessment of quality” was the main benefit obtained, while R&D managers stated more often that the main benefit obtained was a

“greater variety of ideas obtained”. These differences between the two groups of managers might exist due to each group’s priorities for achieving success in their functional roles.

Differences between organizations with less than 1000 employees and those with 1000 or more employees were also compared. As can be observed in Tables 24 and 25, there is very little difference in terms of the expected and observed benefits between the two groups. None of the differences in values between the two organizational sizes was significantly different. One potential explanation for this finding is that the present study used predefined groups of organizational sizes which did not subdivide very large organizations with more than 1000 employees into sub-categories. This lack of granularity diminished the survey instrument’s ability to ascertain the true difference in size between the organizations. Consequently, it is possible that organizations in both the large and very large groups were in the range of approximately 1000 employees, thus there would be little actual difference in the number of employees between the two groups.

Table 26: Frequency of expected benefits of UOPF integration into product development.

Expected Benefit	Frequency				
	Overall (n = 206)	Marketing (n = 97)	R&D (n = 101)	<1000 Employees (n = 94)	1000+ Employees (n = 112)
Access to additional ideas	23%	23%	24%	23%	23%
Greater variety of ideas	22%	21%	21%	22%	21%
More accurate assessment of quality	28%	27%	28%	26%	29%
Less expensive than traditional methods	12%	13%	12%	13%	12%
Data analysis process can be automated	15%	16%	14%	16%	15%

Table 27: Frequency of observed benefits of UOPF integration into product development.

Observed Benefit	Frequency				
	Overall (n = 206)	Marketing (n = 97)	R&D (n = 101)	<1000 Employees (n = 92)	1000+ Employees (n = 112)
Access to additional ideas	24%	23%	24%	23%	25%
Greater variety of ideas	23%	21%	25%	23%	23%
More accurate assessment of quality	23%	25%	20%	24%	22%
Less expensive than traditional methods	13%	16%	12%	13%	14%
Data analysis process can be automated	16%	15%	19%	16%	16%

In addition to inquiring about the expected and obtained benefits of UOPF integration, the survey also asked the respondents to list all the barriers to using UOPF in product development that they have encountered. The most frequently cited barrier (34%) was that “competitors would have access to the same information”. This is not surprising given that UOPF is found online on publicly accessible social media, thus all organizations can access the same feedback. The second most frequent barrier was “uncertainty of benefits” (29%), which was also anticipated given that relatively few empirical studies have attempted to investigate the merit of using UOPF in product development. Nevertheless, there was no significant difference between these two values. Significant differences begin to occur for the next three response options. Significantly fewer ($p < 0.05$) respondents selected the “already satisfied with traditional sources of feedback such as focus groups” (21%) and significantly fewer than that selected the “too complicated” (11%) barrier. Finally, the least frequently cited barrier (5%) was that UOPF was “too expensive”.

Above findings are not unexpected given that one benefit of UOPF is that it is relatively inexpensive to collect. However, when combined with the findings in the previous two tables, it can be summarized that the cost of collecting UOPF serves as neither a motivator nor as a deterrent to using UOPF as a source of customer feedback in product development by large organizations. The cost might be a far more important consideration for very small organizations that have limited marketing budgets. Unfortunately, this assumption cannot be verified in the present study because organizations with less than 100 employees were not surveyed. As was the case with benefits, the 14 free-text responses to questions on barriers did not uncover

additional barriers to UOPF integration. Free-text responses on barriers are provided in Appendix K.

Significant differences between marketing and R&D managers consisted of R&D managers indicating complexity as a greater barrier than marketing managers. Conversely, marketing managers stated that cost was a barrier. One potential explanation for this finding is that marketing managers' familiarity with collecting customer feedback has made them more comfortable with additional sources of feedback such as UOPF. However, their familiarity and relative success with traditional sources of feedback might cause them to resist transitioning to new and unproven sources of feedback. Conversely, R&D managers might not have familiarity with collecting customer feedback but are interested in exploring the possibilities of UOPF as they not overly committed to traditional sources of customer feedback.

Finally, when comparing the responses from individuals working for organizations with less than 1000 employees versus those with 1000 or more employees, several interesting findings emerge. Both groups of respondents identified "competitors have access to the same information" as the most frequently cited barrier to using UOPF in product development. Nevertheless, the only significant difference ($p < 0.05$) between the two groups occurs for the number of times that respondents identified "already satisfied with traditional sources of customer feedback" as a barrier to UOPF integration. While 27% of responses from respondents working in organizations with less than 1000 employees cited this reason, only 16% of responses from organizations with 1000 or more employees cited this specific barrier. Although it is difficult to speculate on the reason for this difference, one plausible explanation is that very large

organizations might be experiencing greater competitive pressures which drive them towards more novel sources of customer feedback such as UOPF. Moreover, large organizations might be more inclined to invest resources in less researched sources of customer feedback such as UOPF in order to extract additional competitive advantage.

Table 28: Frequency of cited barriers to UOPF integration into product development.

Barrier	Frequency				
	Overall (n = 206)	Marketing (n = 97)	R&D (n = 101)	<1000 Employees (n = 94)	1000+ Employees (n = 112)
Uncertainty of benefits	29%	24%	33%	27%	30%
Too complicated	11%	9%	13%	10%	12%
Too expensive	5%	8%	2%	4%	6%
Already satisfied with traditional sources of feedback	21%	24%	18%	27%	16%
Competitors have access to same information	34%	35%	33%	32%	36%

Table 29 lists the ranking of preferences for using particular sources of UOPF. The overall rank for a response was chosen based on the modal position of all responses. This technique provided the most common rank among all of the responses and avoids ambiguity that can exist when overall rankings are calculated using the weighted scoring method (Caragiannis, Procaccia, & Shah, 2014). Overall, in examining the entire sample, it would appear that the preferred sources of UOPF are online product reviews and social networks. Although online product reviews were the most preferred source in the present study, it cannot be stated with certainty that this was significantly more preferred than social networks. Blogs/vlogs and virtual community posts came in third and fourth place, respectively, which indicated more distinctly that these two sources were not as popular as the first two. However, it is again difficult to ascertain the true preference between blogs/vlogs and community posts since the overall ratings for these two sources were very close. Note that this particular survey question did not allow ties, even though this might have been the preferred choice for the respondents. Moreover, it is possible that a general absence of strong preferences among the respondents has resulted in a relatively evenly distributed frequency.

Comparing the responses from marketing and R&D managers, marketing managers showed an equal preference for online product reviews and social networks. Blogs/vlogs and virtual communities were ranked third and fourth, respectively. R&D managers ranked online product reviews as the number one choice, followed by social networks, blogs/vlogs, and virtual communities, respectively. Overall, these results are very comparable to results for the combined sample.

The differences between organizations with less than 1000 and 1000 or more employees were also minor as online product reviews were again the most preferred type of UOPF for both groups. Blogs/vlogs and virtual communities were again in third and fourth position. The only minor difference between the two groups is that respondents from organizations with 1000 or more employees placed social networks as equally important to online product reviews (first place), whereas employees from organizations with less than 1000 employees indicated that social networks were in the second place.

Although it is difficult to speculate without conducting further research, one possible explanation for these findings is that respondents are preferring UOPF sources that are generating the largest amount of responses and public visibility. In particular, social networks and online product reviews are likely expected to reach a broader and larger audience than blogs/vlogs and virtual communities that are comparatively more focused on smaller groups of niche participants. Organizations might feel that focusing on the most visible feedback that customers are exposed to while purchasing products online will have the greatest impact on demonstrating the organizational commitment to developing products that meet their customers' expectations. Another explanation for this finding is that it is relatively easy to link UOPF found on online product reviews to specific products, whereas linking UOPF to products is more difficult in virtual communities where discussions can get off topic or even discuss multiple products simultaneously. Focusing on product reviews can thus simplify the data collection and analysis of feedback for the development of specific products.

Table 29: Ranking of preferences for using particular UOPF sources.

UOPF Source	Ranking Score				
	Overall (n = 206)	Marketing (n = 97)	R&D (n = 101)	<1000 Employees (n = 94)	1000+ Employees (n = 112)
Online product reviews (Amazon.com, <i>etc.</i>)	1 st	1 st	1 st	1 st	1 st
Social networks (Facebook, <i>etc.</i>)	2 nd	2 nd	2 nd	2 nd	1 st
Blogs/Vlogs (Huffington Post/YouTube, <i>etc.</i>)	3 rd	3 rd	3 rd	3 rd	3 rd
Virtual communities (Reddit, <i>etc.</i>)	4 th	4 th	4 th	4 th	4 th

Respondents were also asked to rank the uses of UOPF from most used to least used. As was done in the previous table, overall ranking for uses of UOPF was done by calculating the modal rank. Table 30 shows that “monitoring the customer’s satisfaction with products” was the highest ranked use of UOPF. “Replying to customers’ questions or concerns” was ranked in 2nd place and “monitoring the quality of existing products” was in 3rd place. Finally, “generating ideas for product improvements” and “generating ideas for brand-new products” were ranked in the last (4th and 5th place, respectively) position. Although these results are not conclusive, they indicate that organizations are typically using UOPF as a customer relationship management tool rather than as a source of feedback for product development. Note that these findings are surprising given that the two most frequently cited observed benefits of UOPF are that it provided access to “additional ideas” and a “greater variety of ideas”. Perhaps the managers that were surveyed in this study are aware of possibilities of using UOPF to generate ideas for product development but are not yet using these ideas directly in their product development processes.

Comparing the responses by marketing and R&D managers, the only difference is that marketing placed replying to customer concerns as the number one use of UOPF and monitoring customer satisfaction with products in the second place. R&D managers had the reverse order where monitoring customer satisfaction with products was the number one use of UOPF. Both marketing and R&D managers identified generating ideas for new products and product improvement ideas as the least ranked uses of UOPF.

For the ranked uses of UOPF identified by organizations with less than 1000 employees and those with 1000 or more employees, both groups had very comparable rankings as was the

case for the overall sample. Specifically, “monitoring the customer’s satisfaction with products”, “replying to customers’ questions or concerns” and “monitoring the quality of existing products” were the most frequently cited uses of UOPF by organizations of both sizes. As was the case with other groupings, “generating product improvement ideas” and “ideas for new products” were ranked as the least frequently employed uses of UOPF.

Table 30: Ranking of uses of UOPF in product development.

UOPF Usage	Modal Position				
	Overall (n = 206)	Marketing (n = 97)	R&D (n = 101)	<1000 Employees (n = 94)	1000+ Employees (n = 112)
Monitoring the customers' satisfaction with products	1 st	2 nd	1 st	2 nd	1 st
Replying to customers' questions or concerns	2 nd	1 st	2 nd	1 st	2 nd
Monitoring the quality of existing products	3 rd	3 rd	3 rd	3 rd	3 rd
Generating product improvement ideas	4 th	4 th	4 th	5 th	4 th
Generating ideas for brand new products	5 th	5 th	5 th	4 th	5 th

7.2 Hypothesis Testing

With respect to the initial model (Figure 6) presented in Subsection 4.3, it can be observed that the analysis generally supported the model because most of the expected relationships were supported. The final model is presented in Figure 19. As can be observed, 5 relationships (solid arrows) between variables were found to be significant and positive at the $p < 0.001$ level. Three relationships, shown with dashed arrows, were not significant. As was found in prior literature, cross-functional integration had a direct impact on process success. In turn, process success was an extremely strong predictor of product success.

The novel findings from the present study is that UOPFO was found to fully mediate the impact of customer orientation on process success. In contrast, UOPFO is only partially mediating the relationship between cross-functional integration and process success. No direct relationships were found between customer orientation or UOPFO and product success. Product success was only affected by process success. The implications of these findings are discussed further in the discussion section.

Another important point is that some of the relationships presented in this model could be bi-directional, rather than strictly unidirectional, thus resulting in a non-recursive structural model (Strotz & Wold, 1960). For example, higher levels of product development success could lead to higher levels of UOPFO since organizations that experience the benefits of integrating UOPF will be encouraged to use this source of feedback to greater extent. This is especially true given that SEM software identifies significant relationships between variables in the model but does not assume or test the directionality of the relationships. Ultimately, following analysis in

AMOS, the relationship from product development process and product success on UOPFO were not significant.

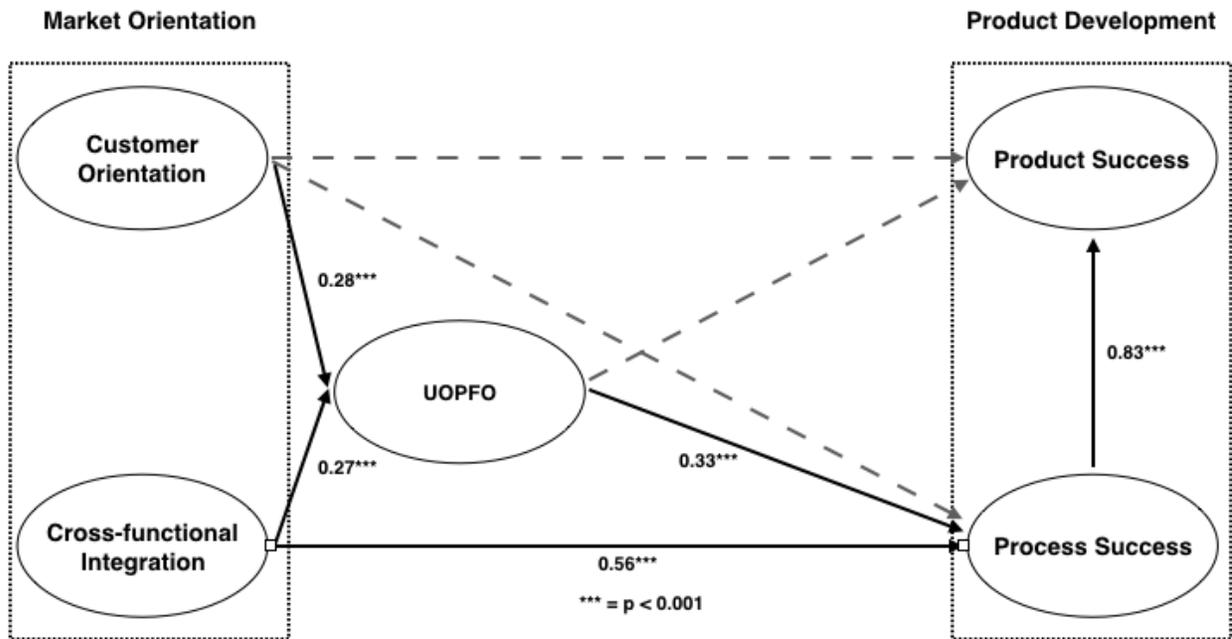


Figure 19: The final model of the effect of UOPFO on product development success.

Next, each of the paths in the model was analysed for significance by examining the path coefficient and significance statistics. Table 31 shows the results of the path analysis. Diamantopoulos and Sigauw (2000) classify path coefficients that are below 0.30 as causing moderate effects, from 0.30 to 0.60 as strong, and above 0.60 as very strong. Based on these criteria, customer orientation and cross-functional integration have a moderate effect on UOPFO. Cross-functional integration has a strong effect on process success and is partially mediated by UOPFO which exerts a strong effect on process success. In this study, UOPFO fully mediates the relationship between customer orientation and process success and it has a moderate effect on process success. Finally, process success has a very strong effect on product success.

Table 31: Path analysis results with significant paths highlighted.

Path	Path Coefficient	Effect Strength	Significance Statistic	Significant
CO → PRDS	0.10	Moderate	0.187	No
CO → PRCS	-0.09	Moderate	0.195	No
CO → UOPFO	0.18	Moderate	p < 0.001	Yes
CFI → UOPFO	0.34	Strong	p < 0.001	Yes
CFI → PRCS	0.55	Strong	p < 0.001	Yes
UOPFO → PRDS	-0.13	Moderate	0.160	No
UOPFO → PRCS	0.33	Strong	p < 0.001	Yes
PRCS → PRDS	0.83	Very Strong	p < 0.001	Yes

The results of hypothesis testing are summarized below in Table 32. As can be observed, hypotheses H2, H3, H4, H6 and H7 were supported, while hypotheses H1a, H1b and H5 were not supported. Implications of these findings are discussed in the next section.

Table 32: Results of hypothesis testing. All significances were at $p < 0.001$ level.

Hypothesis	Description	Result
H1a	Higher levels of customer orientation lead to higher levels of product success.	Not Supported
H1b	Higher levels of customer orientation lead to higher levels of process success.	Not Supported
H2	Higher levels of cross-functional integration lead to higher levels of process success.	Supported
H3	Higher levels of customer orientation lead to higher leaves of UOPFO	Supported
H4	Higher levels of cross-functional integration lead to higher leaves of UOPFO	Supported
H5	Higher levels of UOPFO lead to higher levels of product success.	Not Supported
H6	Higher levels of UOPFO lead to higher levels of process success.	Supported
H7	Higher levels of process success lead to higher levels of product success.	Supported

8.0 DISCUSSION

The first finding from the present study is that in the consumer electronics industry, cross-functional integration has a strong and positive (0.56, $p < 0.001$) impact on the product development process success. Since the path estimate 0.56 is positive, it indicates that an increase in the level of cross-functional integration leads to an increase in product development process success. Customer orientation and cross-functional integration both had a moderate and positive influence on UOPFO (0.28 and 0.27, $p < 0.001$), respectively. In turn, UOPFO had a strong and positive influence on product development process success (0.33, $p < 0.001$).

One explanation for this finding is that organizations with higher levels of customer orientation and cross-functional integration are more capable and/or willing to integrate feedback from social media, in the form of UOPF, as they have already dealt with the barriers to integrating traditional sources of feedback into their product development efforts. In turn, product development organizations with higher levels of UOPFO obtain UOPF feedback from customers that is rich in terms of suggestions for product development. UOPF can also be collected in real-time and faster than is possible using traditional means. The present study thus provides support for collecting UOPF as a means of improving the product development process success. Finally, product development process success had a very strong and positive (0.83, $p < 0.001$) correlation with product success as was also found in many previous studies.

Surprisingly, a direct relationship between customer orientation and product success was not observed as was anticipated originally. This finding is comparable to findings of Kirca et al. (2005), presented previously in Figure 5, who found that customer orientation had a direct effect

on the product development process success which subsequently led to product success. Similarly, although there are methodological differences from the present study, Baker and Sinkula (1999) did not observe a direct relationship between marketing orientation and organizational performance. Note that Baker and Sinkula's organizational performance construct shown in Figure 21 was measured using very similar measurement items to those used for measuring product success in the more contemporary research studies.

Customer orientation only had a direct effect on product success when respondents were marketing managers; no relationship was found for R&D managers. These findings also parallel those of Kahn (2001) who found that only marketing managers supported the relationship between collecting customer feedback and product success, while R&D and manufacturing managers did not. It is conceivable that marketing managers feel more strongly about the ability of the marketing department to directly influence the success of products since marketing managers normally have close interactions with the sales and customer retention departments. The present study assumed that sales were part of marketing, although prior studies have proposed separating sales and marketing (Ernst et al., 2010). In contrast, R&D managers might believe that a successful product development process is the main driver of product success. Indeed, the results of the present study show that process success was a very strong predictor of product success.

The second surprising finding was that UOPFO did not have a direct effect on product success for marketing respondents, but it did for R&D managers. One explanation for this is that not all marketing managers are involved in sales, thus they were not considering the level of

interaction between organizations and customers online. Without these interactions, it is possible that sampled organizations collected UOPF without interacting with the clients, which would have eliminated the opportunity to develop loyalty among online customers. Future studies should investigate the degree of interaction with online customers that organizations are exhibiting while collecting UOPF. This could be accomplished by creating a construct that measures the level of online interaction between organizations and customers during the process of collecting UOPF. An additional explanation is that the present study was conducted in the North American context, whereas many previous studies on online interactions were done outside of North America. Recent research shows that the role of social media in North American culture, which is characterized by low power distance and high individualism, is more important for providing information rather than influencing buying decisions (Goodrich & De Mooij, 2014). Consequently, North American customers might seek UOPF in order to obtain information about products as part of their information search process, but the UOPF itself is not a major factor in the purchase decision. Likewise, the development of superior products appears to be the major determinant of overall product success since North American customers prefer to “let the products speak for themselves”. In the service industry, where customers might feel that online feedback has the potential to affect the services more rapidly, there might be a stronger relationship between UOPFO and product success.

Despite the positive impact of customer feedback on product development process success, including that of UOPF, organizations must approach customer feedback integration from a strategic perspective. According to Nijssen and Frambach (1998) findings, market research has to be used early in the product development process in order to have a positive

impact on product development success. In other words, market research itself does not confer an intrinsic competitive advantage. Furthermore, customer orientation and cross-functional integration efforts need to be focused on the product development organization's strategic goals. Without well-defined goals in place, it is difficult to integrate all of the incoming customer feedback, including UOPF, effectively within the different parts of the organization. Not surprisingly, Tessarolo (2007) found that a strong and well-defined product vision had a positive effect on the relationship between external and internal knowledge integration and product development performance. Moreover, as was discussed in the introductory section, organizations will need to employ automated content analysis systems to identify which UOPF is directly related to products themselves and which is related to other factors such as customer service and after-sale support.

In summary, marketing and R&D managers from product development organizations that were contacted in the present study appear aware of the potential benefits of UOPF. Similar findings were also found by other researchers (Ho & Lee, 2015). Nonetheless, the respondents do not indicate a full commitment to using UOPF as a source of feedback for product development. Most respondents appear unsure if UOPF provides a significant competitive advantage for product development and are cautious of the fact that this source of customer feedback is easily accessed by their competitors. Instead, the organizations are using UOPF as an extension of traditional market research feedback sources for the purpose of monitoring satisfaction and as a means of customer relationship management. This finding was also found in prior research studies (Füller et al., 2006, 2008) One possible explanation for the relatively limited use of UOPF in product development is that the sampled organizations are feeling

confident in their ability to solicit sufficient quantity and quality of customer feedback using traditional feedback collection methods.

9.0 CONCLUSION

This section first explores several limitations of the present study. Next, implications for practitioners, academics and customers are discussed. Finally, concluding thoughts on the results and lessons learned from the present study are used to propose directions for future research.

9.1 Implications

Findings from the present study have implications for practitioners, academics and the general public. In fact, a major value of the present study is that the findings are not confined to academia since they have direct implications for product development organizations. The specific implications for each group are discussed below. In addition, the present study tests and confirms some previously identified implications of customer feedback integration for product development, but in the North American consumer electronics industry context.

Implications for Practitioners

Research on the use of UOPF as a source of customer feedback for product development practitioners is important for several reasons. Most significantly, it can be argued that the product development process is an expensive and complex endeavour that can be improved through harnessing the abundance of customer ideas that are found on social media in the form of UOPF. Since customers typically spend large amounts of time using products that they purchase, they are in an excellent position to identify the deficiencies with these products that were not envisioned by the product development teams themselves. As a result, customers who use products in the new ways can report errors or issues that become apparent only after the product

has been released to the general market. Findings from the present study directly support the idea that UOPF serves this role as it has a strong effect on product development process success. Organizations that integrate UOPF into their product development process have significantly higher levels of product development process success, which then leads to higher levels of product success. As was discussed throughout this document, UOPF is an additional source of ideas for product development that are often richer and more diverse than feedback that is collected from traditional sources such as surveys or focus groups. Nevertheless, although the respondents agreed with the potential benefits of integrating UOPF into product development, very few of them stated that this was how they were primarily using UOPF.

In order to increase the amount of feedback that is collected and integrated from UOPF sources, prior research also indicates that product development organizations can employ advanced feedback systems that allow for multi-dimension evaluation criteria in order to provide additional granularity with respect to which specific product areas can be improved upon (Jannach et al., 2014). Moreover, given that products can have UOPF that rests at the extremes of positive and negative user feedback continuum, product development organizations should not completely focus on UOPF as their sole source of customer feedback. Instead, UOPF should be combined with other types of customer and even professional feedback to provide the product development organizations with multiple sources of feedback (Dellarocas et al., 2007). Since all the managers that were surveyed in the present study worked for well-established organizations, it is very much likely that they are already conducting multiple types of market research.

Implications for Services that Host UOPF

Prior research indicates that online services can encourage visitors to provide UOPF by acknowledging the importance of customer feedback and by ensuring that the most frequent and helpful contributors are acknowledged publicly (Geissler, 2001; Sawhney & Prandelli, 2000). These services should allow customers to provide comments in addition to evaluation scales since this approach allows the customers with more opportunity to share the specific details of their concerns and novel ideas. Finally, obtaining customer feedback has traditionally depended heavily on the ease with which customers were able to provide feedback (Plymire, 1991). As a result, it is important for services to ensure that customers have the ability to express their opinions using their “voice” [feedback] rather than choosing to “exit with their feet” (Hirschman, 1970).

Implications for Academics

This research study is important because very little academic work has been conducted on determining the potential benefits of incorporating UOPF into the product development process. Given that UOPF is very common, easy to obtain, rich with customer feedback, and has a possible impact on the buying intentions of other buyers, this is a severely under-researched area. This study has developed and validated a set of measurement items that can be used to assess the degree to which organizations are open to collecting and integrating UOPF into their product development efforts. Moreover, given that most previous research was focused on linking UOPF to the impact on online purchasing habits, this study is unique as it allows other

researchers to improve the model developed in the study so that it better predicts the effect of UOPF integration on the success of product development process and products.

Future research should examine the potential boundary conditions where UOPF might not be the best source of product feedback for product development. As was previously stated, findings from this study did not identify cost savings as a major factor for using UOPF. However, this might be a far more significant consideration for small organizations that cannot implement the more expensive traditional sources of customer feedback such as focus groups. Also, this study focused on North American marketing and R&D managers, thus it would be worthwhile to investigate how the findings might differ if Asian or European managers were surveyed, for example. Finally, future research will also have to refine the measures developed and used in this study. Doing so will both verify the findings from the present study and also help to develop this topic further.

Implications for Customers

Although it is unlikely that many individuals would access this study, there are also direct implications for customers that create UOPF on social media. As the results of the present study indicate, product development organizations are in fact listening to customer feedback. Customers can encourage organizations to consider their feedback in earnest by creating helpful reviews that contain well-thought-out ideas about how products could be improved. Similarly, product reviews should demonstrate expertise and referencing since this also appealed to product development organizations. In contrast, extreme product reviews, even when positive in nature, are less likely to be adopted because they are assumed less likely to contain constructive

feedback (Lee & Yang, 2015). This flow of knowledge from customers to product development organizations leads to the development of superior products which both delight customers and lead to product success.

9.2 Limitations

The limitations of the present study have been divided into those limitations that are primarily resultant from the specific methodology used in the present study and those that have broader theoretical implications for future studies of UOPF and product development.

Methodological Limitations

This study has several methodological limitations that could be addressed in future research. First, with respect to data collection, the response rate for this study was slightly lower than was originally anticipated, despite being developed according to several survey methodology best practices. In particular, it appears that respondents had reservations about completing an online survey despite proactive approaches described in Subsection 5.1 that should have minimized this concern. In particular, many organizations appear to prevent or discourage employees from completing online surveys originating from external organizations, even if they are supported by legitimate academic institutions. This reluctance could have also resulted in self-selection bias if respondents from specific organizations were subjugated to less strict internal policies on completing surveys. A related limitation of this approach is that the respondents might have been self-selected due to their general interest in the topic or due to positive experiences with online surveys.

Most notable limitations are related to the boundary conditions that this specific study spans. To begin, the present study was developed within the North American context and has focused on a very specific industry. However, prior studies have found that cultural differences exist when cross-functional integration is considered from the perspective of other cultural settings (Garrett et al., 2006; Goodrich & De Mooij, 2014). For example, Japanese product development organizations have traditionally focused heavily on internal R&D efforts (Nonaka & Takeuchi, 1995). The present study also focused on organizational level factors impacting on product development success which are only a subset of all the possible factors that can impact on product development (Cooper & Kleinschmidt, 2007). However, very little consideration was given to the characteristics of the teams themselves that have been found to impact on product development success (Sethi et al., 2001). Consequently, it would be prudent for future studies to also consider organizations with less than 100 employees since these organizations are typically more resource constrained than larger organizations and experience different team dynamics.

The results of this study will also have to be repeated for different categories of products since customers may be more or less likely to provide UOPF for different types of product. For example, expensive products might lead to more customer feedback to be generated since customers have a greater investment in these products. Likewise, product development organizations might be more inclined to collect feedback for underperforming products or products that are new to market since these could be deemed most critical to their strategic success. While this paper did not differentiate directly between radical or incremental product development, the impact of UOPF on these two types of products will also need to be examined given that some researchers argue that customer feedback is more suitable for improvements of

existing products (Lin & Huang, 2012). Finally, it would be beneficial to compare the collection and usage of customer feedback using traditional feedback collection methods such as focus group and telephone surveys. A construct focusing on traditional feedback orientation would provide a baseline to determine whether organizations are not using UOPF in product development because they are focusing on traditional feedback or if the organization is simply not collecting customer feedback irrespective of the source.

Finally, Song and Parry (1992) argue that investigations of cross-functional relationships in product development require the input of marketing, R&D and manufacturing. Since the present study focused on the early stages of the product development process that are dominated by the marketing and R&D functions, it was not deemed necessary to investigate the manufacturing functions' perceptions of product development process and product success. Studies that are focusing on the later stages of the product development process should also consider the perceptions of the manufacturing managers since both the present study and other research has shown differing perspectives depending on the function (Kirca et al., 2005). Moreover, since the findings of the present study indicate that a significant, current use of UOPFO is to perform market research, it would be prudent to measure the amount of online interactions between organizational representatives and customers. Measurement of this construct could provide more insight into whether interacting with customers in the process of collecting UOPF leads to increased product development success.

Theoretical Limitations

The primary theoretical limitation of this study is that it principally examines whether the flow of customer knowledge in the form of UOPF into a product development organization is a sufficient driver of product development success. In actuality, effective usage of knowledge within organizations is a very complex process that involves knowledge dissemination, interpretation and retention (Jaworski & Kohli, 1993; Marsh & Stock, 2006). Even though UOPFO leads to richer customer knowledge to be collected, the organization itself could be limited by its ability to disseminate broad customer knowledge into usable components of knowledge that can improve its product development process. Similarly, unlike the approach used in Marsh and Stock (2006) study, the present study does not examine the impact of time on the changes in the nature of customer feedback and the knowledge contained within. Customer feedback could have an optimal time to be shared within the product development organizations before it becomes obsolete. A longitudinal perspective should be employed in this instance since Wong and Tong (2011) state that cross-sectional studies prevent an assessment of the changes in perception over time. This approach would provide greater insight into whether organizations are becoming increasingly more familiar with UOPF and whether there is a growing intent to use this feedback more directly in product development.

A secondary limitation is that it is possible that researchers and practitioners have different views on what constitutes an “effective product development practice”. This exact topic was examined by Kahn et al. (2012) who found that there was a measurable disconnect between perceptions of researchers and practitioners on the subject of effective management of product development. The authors conclude by stating that researchers need to do a better job of diffusing

state-of-the-art product development knowledge among the practitioner community. The present study bridges this knowledge gap by including specific best practices for integrating UOPF into product development that should provide practical implications for practitioners. Moreover, the present study is the first identifiable one that demonstrates a statistically significant and positive relationship between UOPF integration and product development success.

One possible approach for addressing many of the above limitations is to conduct a detailed case study analysis so that the researcher can directly observe how the various functions are integrating feedback. One example of such a study was conducted by Blazevic and Lievens (2008) who immersed themselves into various service organizations. The authors proceeded to collect data on how organizations managed online community relationships and used the information to improve existing services and even develop new services. The same approach could be used to examine how product development organizations use UOPF to collect feedback to use in product development. Unfortunately, this approach could not be adopted for the present study due to costs and complexities associated with immersive case studies.

9.3 Directions for Future Studies

With Internet usage and online sales at an all-time high, increasing numbers of customers are providing UOPF in the form of virtual community posts, online product reviews, blogs/vlogs and social network posts. Product development organizations must realize the significant importance of UOPF because it has a strong and positive effect on product development process success. Although not conclusive based on the findings of the present and several previous studies, UOPF could also affect product success. The present study indicates that marketing and

R&D managers sampled in the present study were aware of the potential benefits of UOPF. Nevertheless, despite awareness, there was a reluctance, or at best cautious optimism, to use UOPF as the primary source of knowledge for developing new or improved products.

The present study challenges other researchers to replicate the study for additional locations, industries, and product types in order to further understand the effect of UOPF on product development success. Greater understanding of UOPF could encourage product development organizations to consider this form of customer feedback as important for product development as the traditional forms of customer feedback such as surveys and focus groups.

10.0 REFERENCES

- Acuna, E., & Rodriguez, C. (2004). The treatment of missing values and its effect on classifier accuracy. In *Classification, clustering, and data mining applications* (pp. 639–647). Springer. Retrieved from http://link.springer.com/chapter/10.1007/978-3-642-17103-1_60
- Amazon Wants to Kill Fake Product Reviews. (2016, April 26). Retrieved August 29, 2016, from <http://fortune.com/2016/04/26/amazon-more-fake-review-lawsuits/>
- Anastasi, A., & Urbina, S. (1997). *Psychology testing*. New Jersey: Prentice Hall.
- Armstrong, A., & Hagel, J. (1996). The real value of online communities. *Harvard Business Review*, (May-June), 134–141.
- Armstrong, & Overton. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, 396–402.
- Atuahene-Gima, K. (1995). An exploratory analysis of the impact of market orientation on new product performance. *Journal of Product Innovation Management*, 12(4), 275–293.
- Atuahene-Gima, K., Slater, S. F., & Olson, E. M. (2005). The contingent value of responsive and proactive market orientations for new product program performance*. *Journal of Product Innovation Management*, 22(6), 464–482.
- Axelrod, R. M. (2006). *The evolution of cooperation: revised edition*. Basic books.
- Baker, W. E., & Sinkula, J. M. (1999). Learning orientation, market orientation, and innovation: integrating and extending models of organizational performance. *Journal of Market-Focused Management*, 4(4), 295–308.
- Balagué, C., & De Valck, K. (2013). Using blogs to solicit consumer feedback: The role of directive questioning versus no questioning. *Journal of Interactive Marketing*, 27(1), 62–73.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Barney, J. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management*, 27(6), 643–650.

- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173.
- Barton, B. (2006). Ratings, reviews & ROI: How leading retailers use customer word of mouth in marketing and merchandising. *Journal of Interactive Advertising*, 7(1), 47–50.
- Bell fined \$1.25M for planting glowing online reviews of phone apps. (2015). Retrieved August 29, 2016, from <http://www.cbc.ca/news/business/bell-hit-with-1-25m-fine-for-planting-4-star-reviews-for-phone-apps-1.3271222>
- Benfield, J. A., & Szlemko, W. J. (2006). Internet-based data collection: Promises and realities. *Journal of Research Practice*, 2(2), 1.
- Bhaskaran, S. R., & Krishnan, V. (2009). Effort, revenue, and cost sharing mechanisms for collaborative new product development. *Management Science*, 55(7), 1152–1169.
- Birou, L. M., & Fawcett, S. E. (1994). Supplier involvement in integrated product development: a comparison of US and European practices. *International Journal of Physical Distribution & Logistics Management*, 24(5), 4–14.
- Bitzer, J., Schrettl, W., & Schröder, P. J. (2007). Intrinsic motivation in open source software development. *Journal of Comparative Economics*, 35(1), 160–169.
- Blackshaw, P., & Nazzaro, M. (2006). Consumer-generated media (CGM) 101: Word-of-mouth in the age of the web-fortified consumer. *New York: Nielsen BuzzMetrics*, 3.
- Blazevic, V., & Lievens, A. (2008). Managing innovation through customer coproduced knowledge in electronic services: An exploratory study. *Journal of the Academy of Marketing Science*, 36(1), 138–151.
- Bloom, N., Reenen, J. V., & Brynjolfsson, E. (2017, April 19). Good Management Predicts a Firm’s Success Better Than IT, R&D, or Even Employee Skills. Retrieved November 17, 2017, from <https://hbr.org/2017/04/good-management-predicts-a-firms-success-better-than-it-rd-or-even-employee-skills>
- Bonabeau, E. (2009). Decisions 2.0: The power of collective intelligence. *MIT Sloan Management Review*, 50(2), 45.

- Boyd, D., & Ellison, N. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, 13(1), 210–230.
- Brabham, D. C. (2008). Crowdsourcing as a model for problem solving: An introduction and cases. *Convergence*, 14(1), 75–90.
- Brady, M. K., & Cronin, J. J. (2001). Customer orientation effects on customer service perceptions and outcome behaviors. *Journal of Service Research*, 3(3), 241–251.
- Bragge, J., & Merisalo-Rantanen, H. (2002). Engineering e-collaboration processes to obtain innovative end-user feedback on advanced web-based information systems. *Journal of the Association for Information Systems*, 10(3), 4.
- Brockhoff, K. (2003). Customers' perspectives of involvement in new product development. *International Journal of Technology Management*, 26(5), 464–481.
- Brown, S. L., & Eisenhardt, K. M. (1995). Product development: Past research, present findings, and future directions. *Academy of Management Review*, 20(2), 343–378.
- Brown, S. L., & Eisenhardt, K. M. (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly*, 1–34.
- Bryman, A., & Bell, E. (2011). *Business Research Methods 3e*. Oxford university press.
- Bryman, A., & Cramer, D. (2011). *Quantitative data analysis with IBM SPSS 17, 18 and 19*. Routledge.
- Byrne, B. M. (2001). *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming*. Psychology Press.
- Calantone, R. J., Vickery, S. K., & Dröge, C. (1995). Business performance and strategic new product development activities: An empirical investigation. *Journal of Product Innovation Management*, 12(3), 214–223.
- Capon, N., & Glazer, R. (1987). Marketing and technology: A strategic coalignment. *The Journal of Marketing*, 1–14.
- Caragiannis, I., Procaccia, A. D., & Shah, N. (2014). Modal Ranking: A Uniquely Robust Voting Rule. In *AAAI* (Vol. 14, pp. 616–622).

Carr, J., Decreton, L., Qin, W., Rojas, B., Rossochacki, T., & wen Yang, Y. (2015). Social media in product development. *Food Quality and Preference*, 40, 354–364.

Chang, S.-J., Van Witteloostuijn, A., & Eden, L. (2010). From the editors: Common method variance in international business research. *Journal of International Business Studies*, 41(2), 178–184.

Chatterjee, S., & Hadi, A. S. (1986). Influential observations, high leverage points, and outliers in linear regression. *Statistical Science*, 379–393.

Chen, J., Damanpour, F., & Reilly, R. R. (2010). Understanding antecedents of new product development speed: A meta-analysis. *Journal of Operations Management*, 28(1), 17–33.

Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.

Cho, Y., Im, I., Hiltz, R., & Fjermestad, J. (2002). An analysis of online customer complaints: implications for web complaint management. In *System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on* (pp. 2308–2317). IEEE.

Christensen, C. (1997). *The Innovator's Dilemma*. Harvard Business School Press, Boston, MA.

Chu, K.-M., & Chan, H.-C. (2009). Community based innovation: Its antecedents and its impact on innovation success. *Internet Research*, 19(5), 496–516.

Clemons, E. K., Gao, G. G., & Hitt, L. M. (2006). When online reviews meet hyperdifferentiation: A study of the craft beer industry. *Journal of Management Information Systems*, 23(2), 149–171.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 128–152.

Colman, A. M., Morris, C. E., & Preston, C. C. (1997). Comparing rating scales of different lengths: Equivalence of scores from 5-point and 7-point scales. *Psychological Reports*, 80(2), 355–362.

Company Info | Facebook Newsroom. (2016). Retrieved March 24, 2016, from <http://newsroom.fb.com/company-info/>

- Constantinides, E., Wittenberg, K., & Lorenzo-Romero, C. (2014). Co-Innovation: motivators and inhibitors for customers to participate in online co-creation processes. Retrieved from <http://doc.utwente.nl/92002/>
- Cooper. (1990). Stage-gate systems: A new tool for managing new products. *Business Horizons*, 33(3), 44–54.
- Cooper, & Kleinschmidt. (1986). An investigation into the new product process: Steps, deficiencies, and impact. *Journal of Product Innovation Management*, 3(2), 71–85.
- Cooper, & Kleinschmidt. (2007). Winning businesses in product development: The critical success factors. *Research-Technology Management*, 50(3), 52–66.
- Cooper, R. G. (1979). The dimensions of industrial new product success and failure. *The Journal of Marketing*, 43(3), 93–103.
- Crockett, S. A. (2012). A Five-Step Guide to Conducting SEM Analysis in Counseling Research. *Counseling Outcome Research and Evaluation*, 3(1), 30–47. <https://doi.org/10.1177/2150137811434142>
- CTA - U.S. Consumer Technology Sales & Forecasts 2012-2017. (2017). Retrieved February 12, 2017, from <https://www.cta.tech/Research-Standards/Reports-Studies/Studies/2017/U-S-Consumer-Technology-Sales-Forecasts-2012-20.aspx>
- Cuevas-Rodríguez, G., Cabello-Medina, C., & Carmona-Lavado, A. (2013). Internal and External Social Capital for Radical Product Innovation: Do They Always Work Well Together? *British Journal of Management*, 25(2), 266–284. <https://doi.org/10.1111/1467-8551.12002>
- Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, 1(1), 16.
- Dahan, E., & Hauser, J. R. (2002). The virtual customer. *Journal of Product Innovation Management*, 19(5), 332–353.
- Dawes, J. G. (2008). Do data characteristics change according to the number of scale points used? An experiment using 5 point, 7 point and 10 point scales. *International Journal of Market Research*, 51(1).
- Day, G. S. (1994). The capabilities of market-driven organizations. *The Journal of Marketing*, 37–52.

- Dayan, M. (2010). Managerial trust and NPD team performance: team commitment and longevity as mediators. *Journal of Business & Industrial Marketing*, 25(2), 94–105.
- Dellarocas, C. (2003). The digitization of word of mouth: Promise and challenges of online feedback mechanisms. *Management Science*, 49(10), 1407–1424.
- Dellarocas, C., Zhang, X. M., & Awad, N. F. (2007). Exploring the value of online product reviews in forecasting sales: The case of motion pictures. *Journal of Interactive Marketing*, 21(4), 23–45.
- Dell’Era, C., & Verganti, R. (2009). Design-driven laboratories: Organization and strategy of laboratories specialized in the development of radical design-driven innovations. *R&D Management*, 39(1), 1–20.
- Deng, S., & Dart, J. (1994). Measuring market orientation: A multi-factor, multi-item approach. *Journal of Marketing Management*, 10(8), 725–742.
- Deshpandé, R., Farley, J. U., & Webster Jr, F. E. (1993). Corporate culture, customer orientation, and innovativeness in Japanese firms: A quadrad analysis. *The Journal of Marketing*, 23–37.
- Dewar, R. D., & Dutton, J. E. (1986). The adoption of radical and incremental innovations: an empirical analysis. *Management Science*, 1422–1433.
- Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P., & Kaiser, S. (2012). Guidelines for choosing between multi-item and single-item scales for construct measurement: a predictive validity perspective. *Journal of the Academy of Marketing Science*, 40(3), 434–449.
- Diamantopoulos, A., & Siguaw, J. A. (2000). *Introducing LISREL: A guide for the uninitiated*. Sage.
- Donate, M. J., & de Pablo, J. D. S. (2015). The role of knowledge-oriented leadership in knowledge management practices and innovation. *Journal of Business Research*, 68(2), 360–370.
- Dowlathshahi, S. (1997). The role of product design in designer-buyer-supplier interface. *Production Planning & Control*, 8(6), 522–532.
- Duncan, T. (2005). *Principles of advertising & IMC*. McGraw-Hill/Irwin.

- Dyer, B., Gupta, A. K., & Wilemon, D. (1999). How to be a first-to-market company. *Chemtech*, 29(6), 56–61.
- Enkel, E., Kausch, C., & Gassmann, O. (2005). Managing the risk of customer integration. *European Management Journal*, 23(2), 203–213.
- Ernst, H. (2002). Success factors of new product development: A review of the empirical literature. *International Journal of Management Reviews*, 4(1), 1–40.
- Ernst, H., Hoyer, W. D., Krafft, M., & Krieger, K. (2011). Customer relationship management and company performance—the mediating role of new product performance. *Journal of the Academy of Marketing Science*, 39(2), 290–306.
- Ernst, H., Hoyer, W. D., & Rübsaamen, C. (2010). Sales, marketing, and research-and-development cooperation across new product development stages: Implications for success. *Journal of Marketing*, 74(5), 80–92.
- Fang, E., Palmatier, R. W., & Evans, K. R. (2008). Influence of customer participation on creating and sharing of new product value. *Journal of the Academy of Marketing Science*, 36(3), 322–336.
- Fecikova, I. (2004). An index method for measurement of customer satisfaction. *The TQM Magazine*, 16(1), 57–66.
- Finch, B. (1999). Internet discussions as a source for consumer product customer involvement and quality information: An exploratory study. *Journal of Operations Management*, 17(5), 535–556.
- Floh, A., & Treiblmaier, H. (2006). What Keeps the E-Banking Customer Loyal? A Multigroup Analysis of the Moderating Role of Consumer Characteristics on E-Loyalty in the Financial Service Industry. *SSRN*.
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 382–388.
- Forrest, E., & Cao, Y. (2010). Opinions, recommendations and endorsements: The new regulatory framework for social media. *Journal of Business and Policy Research*, 5(2), 88–99.
- Fowler, F. J. (1995). *Improving survey questions: Design and evaluation* (Vol. 38). Sage.

- Friedman, T. L. (2005). *The world is flat: A brief history of the twenty-first century*. Macmillan.
- Frohlich, M. T. (2002). Techniques for improving response rates in OM survey research. *Journal of Operations Management*, 20(1), 53–62.
- Fuchs, C., & Schreier, M. (2011). Customer empowerment in new product development*. *Journal of Product Innovation Management*, 28(1), 17–32.
- Füller, J., Bartl, M., Ernst, H., & Mühlbacher, H. (2006). Community based innovation: How to integrate members of virtual communities into new product development. *Electronic Commerce Research*, 6(1), 57–73.
- Füller, J., Matzler, K., & Hoppe, M. (2008). Brand community members as a source of innovation. *Journal of Product Innovation Management*, 25(6), 608–619.
- Funches, V., Markley, M., & Davis, L. (2009). Reprisal, retribution and requital: Investigating customer retaliation. *Journal of Business Research*, 62(2), 231–238.
- Fundin, A. P., & Bergman, B. L. (2003). Exploring the customer feedback process. *Measuring Business Excellence*, 7(2), 55–65.
- Garrett, T. C., Buisson, D. H., & Yap, C. M. (2006). National culture and R&D and marketing integration mechanisms in new product development: A cross-cultural study between Singapore and New Zealand. *Industrial Marketing Management*, 35(3), 293–307.
- Gassmann, O., & Enkel, E. (2004). Towards a theory of open innovation: Three core process archetypes. In *R&D management conference* (Vol. 6).
- Gassmann, O., Kausch, C., & Ellen, E. (2010). Negative side effects of customer integration. *International Journal of Technology Management*, 50(1), 43–63.
- Gassmann, O., Sandmeier, P., & Wecht, C. H. (2006). Extreme customer innovation in the front-end: learning from a new software paradigm. *International Journal of Technology Management*, 33(1), 46–66.
- Geissler, G. L. (2001). Building customer relationships online: The web site designers' perspective. *Journal of Consumer Marketing*, 18(6), 488–502.
- Goodman, J., DePalma, D., & Broetzmann, S. (1996). Maximizing the value of customer feedback. *Quality Progress*, 29(12), 35.

- Goodrich, K., & De Mooij, M. (2014). How “social” are social media? A cross-cultural comparison of online and offline purchase decision influences. *Journal of Marketing Communications*, 20(1–2), 103–116.
- Gopalakrishnan, S., & Damanpour, F. (1997). A review of innovation research in economics, sociology and technology management. *Omega*, 25(1), 15–28.
- Gorry, G. A., & Westbrook, R. A. (2011). Can you hear me now? Learning from customer stories. *Business Horizons*, 54(6), 575–584.
- Government of Canada. (2012). Canadian Company Capabilities - Home. Retrieved December 31, 2016, from <http://www.ic.gc.ca/eic/site/ccc-rec.nsf/eng/home>
- Grant, R. M. (1996). Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organization Science*, 7(4), 375–387.
- Grant, R. M. (1997). The knowledge-based view of the firm: Implications for management practice. *Long Range Planning*, 30(3), 450–454.
- Griffin. (1997). PDMA research on new product development practices: Updating trends and benchmarking best practices. *Journal of Product Innovation Management*, 14(6), 429–458.
- Griffin, A., & Hauser, J. (1996). Integrating R&D and marketing: A review and analysis of the literature. *Journal of Product Innovation Management*, 13(3), 191–215.
- Griffin, A., & Page. (1996). PDMA success measurement project: Recommended measures for product development success and failure. *Journal of Product Innovation Management*, 13(6), 478–496.
- Gruner, K. E., & Homburg, C. (2000). Does customer interaction enhance new product success? *Journal of Business Research*, 49(1), 1–14.
- Gu, B., Park, J., & Konana, P. (2011). Research Note—The Impact of External Word-of-Mouth Sources on Retailer Sales of High-Involvement Products. *Information Systems Research*, 23(1), 182–196. <https://doi.org/10.1287/isre.1100.0343>
- Gupta, A., & Govindarajan, V. (1991). Knowledge flows and the structure of control within multinational corporations. *Academy of Management Review*, 16(4), 768–792.

- Gupta, A., Raj, S. P., & Wilemon, D. (1986). A model for studying R&D. Marketing interface in the product innovation process. *The Journal of Marketing*, 7–17.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2009). *Multivariate Data Analysis* (7 edition). Upper Saddle River, NJ: Pearson.
- Hamel, G., & Prahalad, C. K. (1990). Corporate imagination and expeditionary marketing. *Harvard Business Review*, 69(4), 81–92.
- Hancock, G. R., & Mueller, R. O. (2001). Rethinking construct reliability within latent variable systems. *Structural Equation Modeling: Present and Future*, 195–216.
- Handfield, R. B. (1994). Effects of concurrent engineering on make-to-order products. *Engineering Management, IEEE Transactions on*, 41(4), 384–393.
- Hao, M., Rohrdantz, C., Janetzko, H., Dayal, U., Keim, D., Haug, L.-E., ... others. (2011). Visual sentiment analysis on twitter data streams. In *Visual Analytics Science and Technology (VAST), 2011 IEEE Conference on* (pp. 277–278). IEEE.
- Harmancioglu, N., McNally, R. C., Calantone, R. J., & Durmusoglu, S. S. (2007). Your new product development (NPD) is only as good as your process: An exploratory analysis of new NPD process design and implementation. *R&D Management*, 37(5), 399–424.
- Harris, L. C. (2001). Market orientation and performance: Objective and subjective empirical evidence from UK companies. *Journal of Management Studies*, 38(1), 17–43.
- Harrison-Walker, L. J. (2001). E-complaining: A content analysis of an internet complaint forum. *Journal of Services Marketing*, 15(5), 397–412.
- Hayduk, L., Cummings, G., Boadu, K., Pazderka-Robinson, H., & Boulianne, S. (2007). Testing! testing! one, two, three—Testing the theory in structural equation models! *Personality and Individual Differences*, 42(5), 841–850.
- Hayes, B. E. (2011). Lessons in Loyalty. *Quality Progress*, March, 24–31.
- He, W., & Yan, G. (2014). Mining blogs and forums to understand the use of social media in customer co-creation. *The Computer Journal*, 58(9), 1909–1920.

- Hennig-Thurau, T., Gwinner, K. P., Walsh, G., & Gremler, D. D. (2004). Electronic word-of-mouth via consumer-opinion platforms: What motivates consumers to articulate themselves on the internet? *Journal of Interactive Marketing, 18*(1), 38–52.
- Herstatt, C., & Von Hippel, E. (1992). From experience: Developing new product concepts via the lead user method: A case study in a “low-tech” field. *Journal of Product Innovation Management, 9*(3), 213–221.
- Hirschman, A. O. (1970). *Exit, voice, and loyalty: Responses to decline in firms, organizations, and states* (Vol. 25). Harvard university press.
- Hjørland, B., & Albrechtsen, H. (1995). Toward a new horizon in information science: domain-analysis. *Journal of the Association for Information Science and Technology, 46*(6), 400–425.
- Ho, C.-I., & Lee, P.-C. (2015). Are blogs still effective to maintain customer relationships? An empirical study on the travel industry. *Journal of Hospitality and Tourism Technology, 6*(1), 5–25.
- Holstroem, H. (2001). Virtual communities as platforms for product development: An interpretive case study of customer involvement in online game development. *ICIS 2001 Proceedings, 34*.
- Homburg, C., & Jensen, O. (2007). The thought worlds of marketing and sales: Which differences make a difference? *Journal of Marketing, 71*(3), 124–142.
- Homburg, C., & Pflesser, C. (2000). A multiple-layer model of market-oriented organizational culture: Measurement issues and performance outcomes. *Journal of Marketing Research, 37*(4), 449–462.
- Homburg, C., Workman Jr, J. P., & Jensen, O. (2002). A configurational perspective on key account management. *The Journal of Marketing, 38–60*.
- Hong, P., Doll, W. J., Nahm, A. Y., & Li, X. (2004). Knowledge sharing in integrated product development. *European Journal of Innovation Management, 7*(2), 102–112.
- Hong, S. W., Han, S. H., & Kim, K.-J. (2008). Optimal balancing of multiple affective satisfaction dimensions: A case study on mobile phones. *International Journal of Industrial Ergonomics, 38*(3), 272–279.

How Social Media Impacts Brand Marketing | Nielsen. (2011). Retrieved January 19, 2018, from <http://www.nielsen.com/ca/en/insights/news/2011/how-social-media-impacts-brand-marketing>

Hu, N., Pavlou, P. A., & Zhang, J. (2006). Can online reviews reveal a product's true quality?: Empirical findings and analytical modeling of Online word-of-mouth communication. In *Proceedings of the 7th ACM conference on Electronic commerce* (pp. 324–330). ACM.

Imai, K., Nonaka, I., & Takeuchi, H. (1985). Managing the new product development process: How Japanese companies learn and unlearn. *The Uneasy Alliance: Managing the Productivity-Technology Dilemma*, 337–375.

Ipe, M. (2003). Knowledge sharing in organizations: A conceptual framework. *Human Resource Development Review*, 2(4), 337–359.

Jalilvand, M. R., & Samiei, N. (2012). The impact of electronic word of mouth on a tourism destination choice: Testing the theory of planned behavior (TPB). *Internet Research: Electronic Networking Applications and Policy*, 22(5), 591–612.

Jannach, D., Zanker, M., & Fuchs, M. (2014). Leveraging multi-criteria customer feedback for satisfaction analysis and improved recommendations. *Information Technology & Tourism*, 14(2), 119–149.

Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research*, 30(2), 199–218.

Jassawalla, A. R., & Sashittal, H. C. (1998). An examination of collaboration in high-technology new product development processes. *Journal of Product Innovation Management*, 15(3), 237–254.

Jaworski, B. J., & Kohli, A. K. (1993). Market orientation: Antecedents and consequences. *The Journal of Marketing*, 53–70.

Jaworski, B. J., & Kohli, A. K. (1996). Market orientation: Review, refinement, and roadmap. *Journal of Market-Focused Management*, 1, 119–135.

Jespersen, K. R. (2011). Online channels and innovation: Are users being empowered and involved? *International Journal of Innovation Management*, 15(6), 1141–1159.

Johnson. (2017, May 4). Google Gmail users targeted in massive phishing attack via Google Doc link. Retrieved September 24, 2017, from <https://www.cnbc.com/2017/05/04/gmail-google-hack-phishing-attack.html>

Johnson, T. J., & Kaye, B. K. (2002). Webelievability: A path model examining how convenience and reliance predict online credibility. *Journalism & Mass Communication Quarterly*, 79(3), 619–642.

Joshi, A. W., & Sharma, S. (2004). Customer knowledge development: Antecedents and impact on new product performance. *Journal of Marketing*, 47–59.

Judd, C. M., Smith, E. R., & Kidder, L. H. (1991). Research methods in social relations. Retrieved from <http://www.citeulike.org/group/108/article/106996>

Kahn. (1996). Interdepartmental integration: A definition with implications for product development performance. *Journal of Product Innovation Management*, 13(2), 137–151.

Kahn. (2001). Market orientation, interdepartmental integration, and product development performance. *Journal of Product Innovation Management*, 18(5), 314–323.

Kahn, Barczak, G., Nicholas, J., Ledwith, A., & Perks, H. (2012). An examination of new product development best practice. *Journal of Product Innovation Management*, 29(2), 180–192.

Kahn, K., Castellon, G., & Griffin, A. (2005). *The PDMA handbook of new product development*. Wiley Online Library.

Kaulio, M. A. (1998). Customer, consumer and user involvement in product development: A framework and a review of selected methods. *Total Quality Management*, 9(1), 141–149.

Keller, R. T. (2001). Cross-functional project groups in research and new product development: Diversity, communications, job stress, and outcomes. *Academy of Management Journal*, 44(3), 547–555.

Khodakarami, F., & Chan, Y. E. (2014). Exploring the role of customer relationship management (CRM) systems in customer knowledge creation. *Information & Management*, 51(1), 27–42.

- Kietzmann, J. H., Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons*, 54(3), 241–251.
- Kim, Bae, & Kang. (2008). The role of online brand community in new product development: Case studies on digital product manufacturers in Korea. *International Journal of Innovation Management*, 12(3), 357–376.
- Kim, & Hovy. (2006). Automatic identification of pro and con reasons in online reviews. In *Proceedings of the COLING/ACL on Main conference poster sessions* (pp. 483–490). Association for Computational Linguistics.
- Kirca, A. H., Jayachandran, S., & Bearden, W. O. (2005). Market orientation: A meta-analytic review and assessment of its antecedents and impact on performance. *Journal of Marketing*, 69(2), 24–41.
- Kleinschmidt, E. J., & Cooper, R. G. (1991). The impact of product innovativeness on performance. *Journal of Product Innovation Management*, 8(4), 240–251.
- Kline, T. J. (2005). *Psychological testing: A practical approach to design and evaluation*. Sage Publications.
- Koen, P., Ajamian, G., Burkart, R., Clamen, A., Davidson, J., D'Amore, R., ... others. (2001). Providing Clarity and a Common Language to the. *Research-Technology Management*, 44(2), 46–55.
- Kohli, A. K., & Jaworski, B. J. (1990). Market orientation: The construct, research propositions, and managerial implications. *The Journal of Marketing*, 1–18.
- Kotler, P., Rackham, N., & Krishnaswamy, S. (2006). Ending the war between sales and marketing. *Harvard Business Review*, 84(7/8), 68.
- Kozinets, R. V. (2010). *Netnography: Doing ethnographic research online*. Sage publications.
- Krishnan, V., & Ulrich, K. T. (2001). Product development decisions: A review of the literature. *Management Science*, 1–21.
- Kumar, V., Aksoy, L., Donkers, B., Venkatesan, R., Wiesel, T., & Tillmanns, S. (2010). Undervalued or overvalued customers: Capturing total customer engagement value. *Journal of Service Research*, 13(3), 297–310.

- Kusumasondjaja, S., Shanka, T., & Marchegiani, C. (2012). Credibility of online reviews and initial trust: The roles of reviewer's identity and review valence. *Journal of Vacation Marketing*, 18(3), 185–195.
- Lambert, M., & Vie, S. (2015). The Role of Micro-Blogging in Responding to Corporate Controversy. In *Maximizing Commerce and Marketing Strategies through Micro-Blogging* (pp. 67–90). IGI Global.
- Lampel, J., & Bhalla, A. (2007). The role of status seeking in online communities: Giving the gift of experience. *Journal of Computer-Mediated Communication*, 12(2), 434–455.
- Lankes, R. D. (2008). Trusting the Internet: New approaches to credibility tools. *Digital Media, Youth, and Credibility*, 101–122.
- Lawrence, P. R., & Lorsch, J. W. (1967). Differentiation and integration in complex organizations. *Administrative Science Quarterly*, 1–47.
- Lawrence, P. R., & Lorsch, J. W. (1986). *Organization and Environment: Managing Differentiation and Integration* (Harvard Business School Classics). Retrieved from <http://www.citeulike.org/group/2546/article/1412797>
- Lee, K. Y., & Yang, S.-B. (2015). The role of online product reviews on information adoption of new product development professionals. *Internet Research*, 25(3), 435–452.
- Leenders, R. T. A. J., & Dolfsma, W. A. (2016). Social Networks for Innovation and New Product Development. *Journal of Product Innovation Management*, 33(2), 123–131. <https://doi.org/10.1111/jpim.12292>
- Leonard-Barton, D. (1998). *Wellsprings of knowledge: Building and sustaining the sources of innovation*. Harvard Business Press.
- Leung, D., Rispoli, L., & Chan, R. (2012). *Small, medium-sized, and large businesses in the Canadian economy: Measuring their contribution to gross domestic product from 2001 to 2008*. Statistics Canada, Economic Analysis Division. Retrieved from <http://www.orhna.com/Portals/0/Insider/2013/Small,med,large%20business.pdf>
- Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, 14(S2), 95–112.

- Li, X., Hitt, L. M., & Zhang, Z. J. (2011). Product reviews and competition in markets for repeat purchase products. *Journal of Management Information Systems*, 27(4), 9–42.
- Lim, E.-P., Nguyen, V.-A., Jindal, N., Liu, B., & Lauw, H. W. (2010). Detecting product review spammers using rating behaviors. In *Proceedings of the 19th ACM international conference on Information and knowledge management* (pp. 939–948). ACM.
- Lin, M.-J., & Huang, C.-H. (2012). The impact of customer participation on NPD performance: The mediating role of inter-organisation relationship. *Journal of Business & Industrial Marketing*, 28(1), 3–15.
- Linders, D. (2012). From e-government to we-government: Defining a typology for citizen coproduction in the age of social media. *Government Information Quarterly*, 29(4), 446–454.
- Little, T. D., Card, N. A., Bovaird, J. A., Preacher, K. J., & Crandall, C. S. (2007). Structural equation modeling of mediation and moderation with contextual factors. *Modeling Contextual Effects in Longitudinal Studies*, 1, 207–230.
- Litvin, S. W., Goldsmith, R. E., & Pan, B. (2008). Electronic word-of-mouth in hospitality and tourism management. *Tourism Management*, 29(3), 458–468.
- Liu, S. Q., & Mattila, A. S. (2015). “I Want to Help” versus “I Am Just Mad” How Affective Commitment Influences Customer Feedback Decisions. *Cornell Hospitality Quarterly*, 56(2), 213–222.
- Lusch, R. F., & Laczniak, G. R. (1987). The evolving marketing concept, competitive intensity and organizational performance. *Journal of the Academy of Marketing Science*, 15(3), 1–11.
- Lynch, P., O’Toole, T., & Biemans, W. (2016). Measuring Involvement of a Network of Customers in NPD. *Journal of Product Innovation Management*, 33(2), 166–180.
- MacCallum, R. C., Widaman, K. F., Preacher, K. J., & Hong, S. (2001). Sample size in factor analysis: The role of model error. *Multivariate Behavioral Research*, 36(4), 611–637.
- Mackiewicz, J. (2010). Assertions of expertise in online product reviews. *Journal of Business and Technical Communication*, 24(1), 3–28.
- Maguire, S., Koh, S. L., & Huang, C. (2007). Identifying the range of customer listening tools: a logical pre-cursor to CRM? *Industrial Management & Data Systems*, 107(4), 567–586.

Malbon, J. (2013). Taking Fake Online Consumer Reviews Seriously. *Journal of Consumer Policy*, 1–19.

Marsh, S. J., & Stock, G. N. (2006). Creating dynamic capability: The role of intertemporal integration, knowledge retention, and interpretation. *Journal of Product Innovation Management*, 23(5), 422–436.

McCarthy, I. P., Tsinopoulos, C., Allen, P., & Rose-Anderssen, C. (2006). New product development as a complex adaptive system of decisions. *Journal of Product Innovation Management*, 23(5), 437–456.

McQuarrie, E. F., & McIntyre, S. H. (1992). *The customer visit: An emerging practice in business-to-business marketing*. Marketing Science Institute.

Mitchell, V.-W. (1994). Using industrial key informants: Some guidelines. *Journal of the Market Research Society*. Retrieved from <http://psycnet.apa.org/psycinfo/1994-39336-001>

Moran, P., & Ghoshal, S. (1999). Markets, firms, and the process of economic development. *Academy of Management Review*, 24(3), 390–412.

Mudambi, S. M., & Schuff, D. (2010). What makes a helpful online review? A study of customer reviews on Amazon. com. *MIS Quarterly*, 34(1), 185–200.

Murphy, J., Forrest, E., & Wotring, C. E. (1996). Restaurant marketing on the worldwide web. *The Cornell Hotel and Restaurant Administration Quarterly*, 37(1), 61–71.

Murphy, S. A., & Kumar, V. (1996). The role of predevelopment activities and firm attributes in new product success. *Technovation*, 16(8), 431–449.

Murphy, S. A., & Kumar, V. (1997). The front end of new product development: a Canadian survey. *R&D Management*, 27(1), 5–15.

Nambisan, S. (2002). Designing virtual customer environments for new product development: Toward a theory. *Academy of Management Review*, 27(3), 392–413.

Nambisan, S. (2003). Information systems as a reference discipline for new product development. *Mis Quarterly*, 27(1), 1–18.

Nambisan, S., & Sawhney, M. (2011). Orchestration processes in network-centric innovation: Evidence from the field. *The Academy of Management Perspectives*, 25(3), 40–57.

- Narver, J. C., & Slater, S. F. (1990). The effect of a market orientation on business profitability. *The Journal of Marketing*, 20–35.
- Narver, J. C., Slater, S. F., & MacLachlan, D. L. (2004). Responsive and Proactive Market Orientation and New-Product Success*. *Journal of Product Innovation Management*, 21(5), 334–347.
- Nasser, F., & Wisenbaker, J. (2003). A Monte Carlo study investigating the impact of item parceling on measures of fit in confirmatory factor analysis. *Educational and Psychological Measurement*, 63(5), 729–757.
- Nijssen, E. J., & Frambach, R. T. (1998). Market research companies and new product development tools. *Journal of Product & Brand Management*, 7(4), 305–318.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford university press.
- Normann, R., & Ramirez, R. (1994). Designing interactive strategy: From value chain to value constellation. *Harvard Business Review*, 71(4), 65–77.
- Nunnally, J. C., Bernstein, I. H., & Berge, J. M. ten. (1967). *Psychometric theory* (Vol. 226). McGraw-Hill New York.
- O'Hern, M., & Rindfleisch, A. (2010). Customer co-creation: A Typology and Research Agenda. Ed.) NK Malhotra, *Review of Marketing Research*, *Review of Marketing Research*, 6, 84–106.
- Olson, E. M., Walker Jr, O. C., & Ruekert, R. W. (1995). Organizing for effective new product development: the moderating role of product innovativeness. *The Journal of Marketing*, 48–62.
- Olson, E. M., Walker, O. C., Ruekerf, R. W., & Bonnerd, J. M. (2001). Patterns of cooperation during new product development among marketing, operations and R&D: Implications for project performance. *Journal of Product Innovation Management*, 18(4), 258–271.
- Opoku, R. A. (2006). Gathering customer feedback online and Swedish SMEs. *Management Research News*, 29(3), 106–127.
- Orcik, A., Tekic, Z., & Anisic, Z. (2013). Customer co-creation throughout the product life cycle. *International Journal of Industrial Engineering and Management*, 4(1), 43–49.

- O'Reilly, T. (2007). *What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software* (SSRN Scholarly Paper No. ID 1008839). Rochester, NY: Social Science Research Network.
- Peddibhotla, N. B. (2013). Why different motives matter in sustaining online contributions. *Electronic Commerce Research and Applications*, 12(2), 90–102.
- Peltola, T., & Mäkinen, S. J. (2014). Influence of the adoption and use of social media tools on absorptive capacity in new product development. *Engineering Management Journal*, 26(3), 45–51.
- Petersen, K. J., Handfield, R. B., & Ragatz, G. L. (2005). Supplier integration into new product development: Coordinating product, process and supply chain design. *Journal of Operations Management*, 23(3–4), 371–388.
- Peterson, A., & Schaefer, D. (2014). Social Product Development: Introduction, Overview, and Current Status. In *Product Development in the Socio-sphere* (pp. 1–33). Springer.
- Petroff, A. (2017, June 30). Experts: Global cyberattack looks more like “sabotage” than ransomware. *CNN*. Retrieved from <http://money.cnn.com/2017/06/30/technology/ransomware-cyber-attack-computer/index.html>
- Pfeffer, J., & Salancik, G. R. (2003). *The external control of organizations: A resource dependence perspective*. Stanford Business Books.
- Phang, C. W., Kankanhalli, A., & Tan, B. C. (2015). What Motivates Contributors vs. Lurkers? An Investigation of Online Feedback Forums. *Information Systems Research*, 26(4), 773–792.
- Piller, F. T., & Susumu, O. (2006). Reducing the risks of new product development. *MIT Sloan Management Review*, 47(2), 65.
- Piller, F. T., Vossen, A., & Ihl, C. (2012). From social media to social product development: The impact of social media on co-creation of innovation. *Die Unternehmung*, 65(1).
- Ping, R. A. (2004). On assuring valid measures for theoretical models using survey data. *Journal of Business Research*, 57(2), 125–141.
- Pitt, L. F., Watson, R. T., Berthon, P., Wynn, D., & Zinkhan, G. (2006). The penguin’s window: Corporate brands from an open-source perspective. *Journal of the Academy of Marketing Science*, 34(2), 115–127.

Plymire, J. (1991). Complaints as opportunities. *Journal of Services Marketing*, 5(1), 61–65.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879.

Porter, C. E. (2004). A typology of virtual communities: A multi-disciplinary foundation for future research. *Journal of Computer-Mediated Communication*, 10(1), 0–0.

Porter, M. (1980). *Competitive strategy: Techniques for analyzing industries and competitors*. The Free Press.

Prahalad, C. K., & Ramaswamy, V. (2000). Co-opting customer competence. *Harvard Business Review*, 78(1), 79–90.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, 18(3), 5–14.

Primo, A., & Amundson, D. (2002). An exploratory study of the effects of supplier relationships on new product development outcomes. *Journal of Operations Management*, 20(1), 33–52.

Puah, C., Bakar, A. Z. A., & Ching, C. W. (2011). Strategies for community based crowdsourcing. In *Research and Innovation in Information Systems (ICRIIS), 2011 International Conference on* (pp. 1–4). IEEE.

Quinn, J. B. (2000). Outsourcing innovation: The new engine of growth. *Sloan Management Review*, 41(4), 13–28.

Ramirez, R. (1999). Value co-production: Intellectual origins and implications for practice and research. *Strategic Management Journal*, 20(1), 49–65.

Raubenheimer, J. (2004). An item selection procedure to maximize scale reliability and validity. *SA Journal of Industrial Psychology*, 30(4), p–59.

Reichheld, F. F. (1996). The satisfaction trap. *Harvard Business Review*, 74(2), 58–59.

Rosenberg, S. (2009). *Say Everything: How Blogging Began, What It's Becoming, and Why It Matters*. Crown/Archetype.

- Rothwell, R. (1977). The characteristics of successful innovators and technically progressive firms (with some comments on innovation research). *R&D Management*, 7(3), 191–206.
- Rundquist, J., & Halila, F. (2010). Outsourcing of NPD activities: A best practice approach. *European Journal of Innovation Management*, 13(1), 5–23.
- Salavou, H., & Lioukas, S. (2003). Radical product innovations in SMEs: The dominance of entrepreneurial orientation. *Creativity and Innovation Management*, 12(2), 94–108.
- Sampson, S. E. (1996). Ramifications of Monitoring Service Quality Through Passively Solicited Customer Feedback*. *Decision Sciences*, 27(4), 601–622.
- Sampson, S. E. (1998). Gathering customer feedback via the Internet: Instruments and prospects. *Industrial Management & Data Systems*, 98(2), 71–82.
- Sandmeier, P., Morrison, P. D., & Gassmann, O. (2010). Integrating customers in product innovation: Lessons from industrial development contractors and in-house contractors in rapidly changing customer markets. *Creativity and Innovation Management*, 19(2), 89–106.
- Sawhney, M., & Prandelli, E. (2000). Communities of Creation: Managing distributed innovation in turbulent markets. *California Management Review*, 42(4), 24–54.
- Sawhney, M., Verona, G., & Prandelli, E. (2005). Collaborating to create: The Internet as a platform for customer engagement in product innovation. *Journal of Interactive Marketing*, 19(4), 4–17.
- Schneider, B., & Bowen, D. E. (2010). *Winning the service game*. Springer.
- Schumacker, R., & Lomax, R. (2010). *Structural Equation Modeling: A beginner's Guide*. New York: Routledge.
- Schumpeter, J. A. (2013). *Capitalism, socialism and democracy*. Routledge.
- Scott, W. R. (2003). *Organizations: rational, natural, and open systems* (Fifth Edition). Prentice Hall.
- Sethi, R. (2000). New product quality and product development teams. *The Journal of Marketing*, 1–14.

- Sethi, R., Smith, D. C., & Park, C. W. (2001). Cross-functional product development teams, creativity, and the innovativeness of new consumer products. *Journal of Marketing Research*, 38(1), 73–85.
- Sharma, S., Mukherjee, S., Kumar, A., & Dillon, W. R. (2005). A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure models. *Journal of Business Research*, 58(7), 935–943.
- Sherman, J. D., Berkowitz, D., & Souder, W. E. (2005). New product development performance and the interaction of cross-functional integration and knowledge management. *Journal of Product Innovation Management*, 22(5), 399–411.
- Singh, P. J., & Power, D. (2009). The nature and effectiveness of collaboration between firms, their customers and suppliers: A supply chain perspective. *Supply Chain Management: An International Journal*, 14(3), 189–200.
- Sivadas, E., & Dwyer, F. R. (2000). An examination of organizational factors influencing new product success in internal and alliance-based processes. *The Journal of Marketing*, 64(1), 31–49.
- Slater, S. F., & Narver, J. C. (1995). Market orientation and the learning organization. *The Journal of Marketing*, 63–74.
- Smith, P. G., & Reinertsen, D. G. (1991). *Developing products in half the time*. Van Nostrand Reinhold New York.
- Song, X. M., & Parry, M. E. (1992). The R&D–marketing interface in Japanese high-technology firms. *Journal of Product Innovation Management*, 9(2), 91–112.
- Souder, W. E. (1988). Managing relations between R&D and marketing in new product development projects. *Journal of Product Innovation Management*, 5(1), 6–19.
- Stauss, B., & Neuhaus, P. (1997). The qualitative satisfaction model. *International Journal of Service Industry Management*, 8(3), 236–249.
- Stevens, G. A., & Burley, J. (2003). Piloting the rocket of radical innovation. *Research Technology Management*, 46(2), 16–25.
- Stewart, T., & Ruckdeschel, C. (1998). *Intellectual capital: The new wealth of organizations*. Wiley Online Library.

Sun, G.-D., Wu, Y.-C., Liang, R.-H., & Liu, S.-X. (2013). A survey of visual analytics techniques and applications: State-of-the-art research and future challenges. *Journal of Computer Science and Technology*, 28(5), 852–867.

Swink, M. (2000). Technological innovativeness as a moderator of new product design integration and top management support. *Journal of Product Innovation Management*, 17(3), 208–220.

Swink, M., & Song, M. (2007). Effects of marketing-manufacturing integration on new product development time and competitive advantage. *Journal of Operations Management*, 25(1), 203–217.

Szymanski, D. M., & Henard, D. H. (2001). Customer satisfaction: A meta-analysis of the empirical evidence. *Journal of the Academy of Marketing Science*, 29(1), 16–35.

Tashakkori, A., & Teddlie, C. (2010). *Handbook of mixed methods in social & behavioral research*. Sage.

Tessarolo, P. (2007). Is integration enough for fast product development? An empirical investigation of the contextual effects of product vision. *Journal of Product Innovation Management*, 24(1), 69–82.

Thompke, S., & Von Hippel, E. (2002). Customers as innovators. *Harvard Business Review*, 80(4), 74–81.

Tong, Y., Wang, X., Tan, C.-H., & Teo, H.-H. (2013). An empirical study of information contribution to online feedback systems: A motivation perspective. *Information & Management*, 50(7), 562–570.

Troy, L. C., Hirunyawipada, T., & Paswan, A. K. (2008). Cross-functional integration and new product success: an empirical investigation of the findings. *Journal of Marketing*, 72(6), 132–146.

Tuomi, I. (2002). *Networks of innovation*. Oxford University Press Oxford.

Uлага, W., & Eggert, A. (2006). Relationship value and relationship quality: Broadening the nomological network of business-to-business relationships. *European Journal of Marketing*, 40(3/4), 311–327.

- Urban, G. L., & Von Hippel, E. (1988). Lead user analyses for the development of new industrial products. *Management Science*, 34(5), 569–582.
- Veryzer, R. W. (1998). Key factors affecting customer evaluation of discontinuous new products. *Journal of Product Innovation Management*, 15(2), 136–150.
- Von Hippel, E. (1986). Lead users: A source of novel product concepts. *Management Science*, 32(7), 791–805.
- Von Hippel, E. (2005). *Democratizing innovation*. MIT press.
- Von Hippel, E., & Katz, R. (2002). Shifting innovation to users via toolkits. *Management Science*, 48(7), 821–833.
- Voorberg, W. H., Bekkers, V. J., & Tummers, L. G. (2015). A systematic review of co-creation and co-production: Embarking on the social innovation journey. *Public Management Review*, 17(9), 1333–1357.
- Wagner, S. M., & Hoegl, M. (2006). Involving suppliers in product development: Insights from R&D directors and project managers. *Industrial Marketing Management*, 35(8), 936–943.
- Wang, F., Liu, X., & Fang, E. E. (2015). User reviews variance, critic reviews variance, and product sales: An exploration of customer breadth and depth effects. *Journal of Retailing*, 91(3), 372–389.
- Ward, S., Girardi, A., & Lewandowska, A. (2006). A Cross-National Validation of the Narver and Slater Market Orientation Scale. *Journal of Marketing Theory and Practice*, 14(2), 155–167. <https://doi.org/10.2753/MTP1069-6679140205>
- Wind, J., & Mahajan, V. (1997). Editorial: Issues and opportunities in new product development: An introduction to the special issue. *Journal of Marketing Research*, 34(1), 1–12.
- Wirtz, J., Kuan Tambyah, S., & Mattila, A. S. (2010). Organizational learning from customer feedback received by service employees: A social capital perspective. *Journal of Service Management*, 21(3), 363–387.
- Wirtz, J., & Tomlin, M. (2000). Institutionalising customer-driven learning through fully integrated customer feedback systems. *Managing Service Quality*, 10(4), 205–215.

Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement, 73*(6), 913–934.

Wong, S. K. S., & Tong, C. (2011). The mediating effects of customer and competitor orientations on new product success. *International Journal of Business and Management, 6*(8), p34.

Workman Jr, J. P. (1993). Marketing's limited role in new product development in one computer systems firm. *Journal of Marketing Research, 405–421*.

Wren, B. M., Souder, W. E., & Berkowitz, D. (2000). Market orientation and new product development in global industrial firms. *Industrial Marketing Management, 29*(6), 601–611.

Xiang, Z., & Gretzel, U. (2010). Role of social media in online travel information search. *Tourism Management, 31*(2), 179–188.

Ye, J., Marinova, D., & Singh, J. (2007). Strategic change implementation and performance loss in the front lines. *Journal of Marketing, 71*(4), 156–171.

Yeh, T. M., Pai, F. Y., & Yang, C. C. (2010). Performance improvement in new product development with effective tools and techniques adoption for high-tech industries. *Quality and Quantity, 44*(1), 131–152.

Zaglia, M. E. (2013). Brand communities embedded in social networks. *Journal of Business Research, 66*(2), 216–223.

Zeng, F., Huang, L., & Dou, W. (2009). Social factors in user perceptions and responses to advertising in online social networking communities. *Journal of Interactive Advertising, 10*(1), 1–13.

11.0 APPENDICES

Appendix A: Tassarolo (2007) Framework

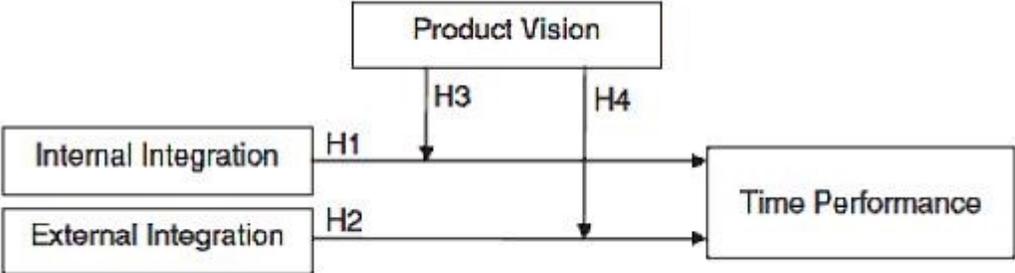


Figure 20: Tassarolo (2007) model depicting the moderating impact of product vision.

Appendix B: Baker and Sinkula (1999) Framework

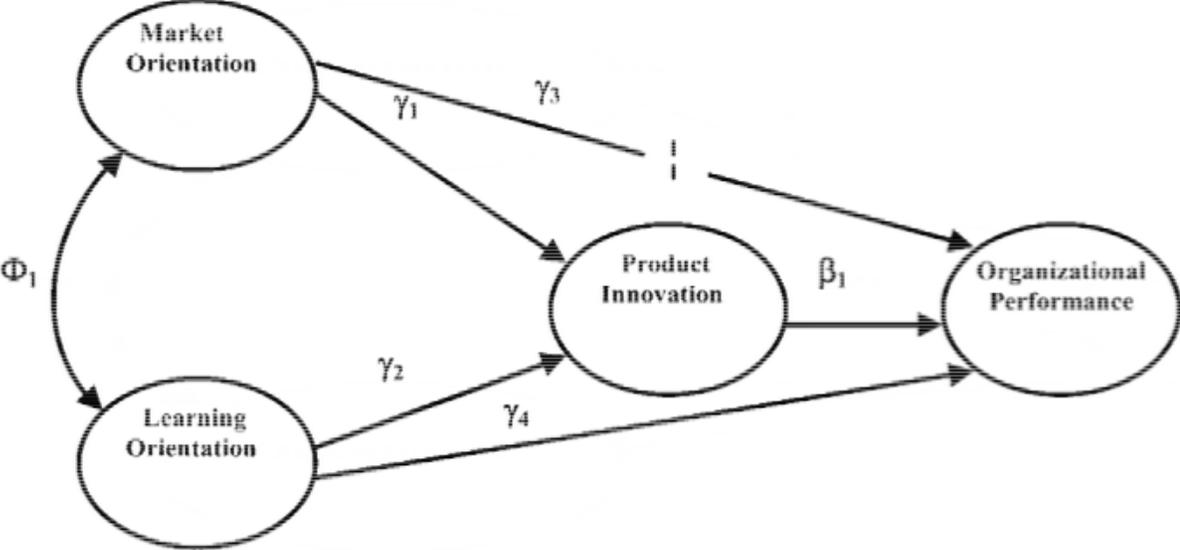


Figure 21: Baker and Sinkula’s (1999) model of learning and market orientation.

Appendix C: Walmart Online Product Review Invite Email

Review your Onn 6' High Speed HDMI Cable with 10.2Mbps Ethernet



Hi Din Begovic!

What do you think about your recent purchase? Do you love it? Like it? Think it could be better? Please take a moment to share your thoughts with the [Walmart.ca](#) community and help others make informed decisions.

[Write a review](#)

Onn 6' High Speed HDMI Cable with 10.2Mbps Ethernet

Thank you,
Walmart Canada

P.S. How was your ordering and shipping experience? Take a quick survey (we promise it's quick) to let us know how we're doing, and what we could do to improve shopping with [Walmart.ca](#). [Rate your ordering and shipping experience.](#)



Appendix D: BestBuy Online Product Review Invitation Email

Invitation to review this product: Apple TV 32GB 4th Generation

Reward Zone Credit Cards Store Locator Weekly Ad
GIFT CARDS GEEK SQUAD MY ACCOUNT

Hi Din,

Thank you for your recent purchase of **Apple TV 32GB 4th Generation** on [BestBuy.ca](#). Did you like it? Well here's your chance to let others know how you feel! Just write up a customer product review and you'll help others make an informed choice on future purchases.



Apple TV 32GB 4th Generation

Average Overall rating

★ ★ ★ ☆ ☆

3.56 / 5

Based on 16 rating

Review this product and share your experience with other customers

[Write a review](#)

Appendix E: Survey Invite

The screenshot shows a browser window with the address bar displaying "linkedin.com". The LinkedIn logo is visible in the top left corner. The main content of the post is a survey invitation. At the top, it asks "Can you spare a few moments to take my survey?" and provides details about the survey from surveymonkey.com. Below this, there is a checkbox for "Share an update" which is checked. The main text of the post is enclosed in a box and includes a title, a greeting, a request for assistance with a PhD study, an offer of a summary and a prize draw, a survey link, and a sign-off. Below the text box, there are sharing options: "Share with:" set to "Public", a "Post to groups" checkbox (unchecked), and a "Send to individuals" checkbox (checked). At the bottom, there are input fields for "To*" and "Message*", and a "Share" button.

Can you spare a few moments to take my survey?
surveymonkey.com · Please take the survey titled "Unsolicited Online Product Feedback Pretest". Your feedback is important!
Edit

Share an update

The Link Between Social Media and Product Development Success

Hello, please assist me in my PhD studies by completing a brief, 8-minute survey on the role of customer feedback in product development. Your experience and current role make you uniquely qualified to provide me with insight.

In return, I can provide you with a summary of my final findings that could help your business to develop successful products more rapidly and cost-effectively. You will also be entered into a prize draw for one of five \$25 Starbucks gift cards.

<https://www.surveymonkey.com/r/UOPF-SURVEY>

Thank you,
Din

Share with: Public

Post to groups
 Send to individuals

To* Start typing a name

Message* Thought you might be interested in seeing this.

Share

Appendix F: Survey Introduction



Date: April 2017

Dear Survey Participant,

STUDY PURPOSE: I am a PhD candidate at the Sprott School of Business at Carleton University in Ottawa, Canada. I am currently researching the extent to which product development organizations are using **unsolicited online product feedback** that is created by end users (customers) on social media. Social media that contain feedback typically include virtual community comments, social network posts, blogs/vlogs, and online product reviews. The goal of this study is to investigate whether organizations with higher levels of unsolicited online product feedback orientation achieve higher levels of product development process success and product success.

SURVEY INFORMATION: I am kindly requesting your participation in the study by completing a brief 15-minute SurveyMonkey® questionnaire. There are no foreseen risks to participating in this study since your identity will be kept confidential and will not be disclosed to any outside parties. Anonymity will further be ensured by aggregating the responses when presenting the research findings. Note that Survey Monkey® servers are located in the United States and are thus subject to the United States privacy laws. The research findings from this study will be presented in the final PhD Thesis and in a series of research papers that will be presented in academic journals and/or at academic conferences. Completed response forms will be stored electronically for a period of one year with only the researcher having access to the data. You can withdraw from participation by hitting the “exit survey” button at any time.

COMPENSATION: If you would like a summary of the study findings or wish to enter into a prize draw for one of three \$25 Starbucks gift cards, please provide your information at the end of the questionnaire. Or, if you would like your survey to remain completely anonymous, contact me directly via email. Your responses will directly contribute to the completion of my PhD studies and could help businesses to improve their product development efforts.

CONTACT INFORMATION: Should you require additional information, please do not hesitate to contact me via email at: din.begovic@carleton.ca. Alternatively, you can contact my supervisors Dr. Vinod Kumar at: vinod.kumar@carleton.ca or Dr. Uma Kumar at: uma.kumar@carleton.ca. This study has been reviewed by the Carleton University Research Ethics Board (CUREB-A). If you have any ethical concerns with the study (Ethics clearance #106195), please contact Dr. Andy Adler, Chair, Carleton University Research Ethics Board-A (by phone at 613-520-2600 ext. 2517 or via email at ethics@carleton.ca).

Thank you very much for your participation,

Din Begovic

Appendix G: Survey Instrument

Study of the Impact of Unsolicited Online Product Feedback on Product Development Success

This survey investigates the impact of unsolicited online product feedback on product development process and product success. Unsolicited online product feedback is feedback that is created by the customers themselves on social media such as virtual communities (ex. online forums such as Reddit), blogs and vlogs (ex. Huffington Post and YouTube, respectively), product reviews on retail websites (ex. Amazon.com), and social networking sites (ex. Facebook and Twitter).

Respondent Information/Screening

Questions in this section will help us group and organize the survey responses.

1. What industry does your business primarily operate in?
 - Automotive
 - Consumer electronics
 - Government
 - Heavy manufacturing (industrial equipment)
 - Not-for-profit
 - Pharmaceuticals
 - Tourism/Hospitality
 - Other (Please specify) _____

2. Where is your business unit located?
 - Canada
 - United States
 - Europe
 - India
 - China
 - Other (Please specify) _____

3. How many employees is your business currently employing?
 - 1 to 99
 - 100 to 499
 - 500 to 999
 - 1000 or more
 - Don't know/Not sure

4. How would you best identify your current role?
 - Marketing manager
 - Product research and development (R&D) manager
 - Marketing employee (non-management)
 - Product R&D employee (non-management)
 - Other (Please specify) _____

5. About how long have you been in your current position?
 - Less than 1 year
 - 1 to 5 years
 - 6 to 10 years
 - More than 10 years
 - Not sure/Prefer not to say

6. Based on the definition of unsolicited online product feedback provided in the survey introduction and at the top of this page, how long has your company been using this type of feedback in product development?
 - We don't use unsolicited online product feedback
 - Less than 1 year
 - 1 to 5 years
 - 6 to 10 years
 - More than 10 years
 - Don't know/Not sure

Customer Orientation

Customer orientation refers to the behaviours and attitudes that businesses undertake to respond to their customers' needs by, among other ways, developing superior products. Please rate the extent to which you agree or disagree with the following statements.

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know / Not sure
7	We frequently engage our customers for feedback.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Maintaining a long-term relationship with customers is important to us.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Customers are an important part of our R&D process.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	We reward our employees for responding to customer needs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Cross-functional Integration

Cross-functional integration refers to the communication and collaboration activities between business functions that are required for the effective flow of knowledge in product development. Please rate the extent to which you agree or disagree with the following statements.

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know / Not sure
11	We organize cross-functional meetings regularly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	We have a business-wide process for sharing knowledge between units.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	We place much value on information flow within our business.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Different functions in our business work as teams.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Unsolicited Online Product Feedback Orientation

Unsolicited online product feedback is feedback that is created by the customers themselves on social media such as virtual communities (ex. online forums such as Reddit), blogs and vlogs (ex. Huffington Post and YouTube), product reviews on retail websites (ex. Amazon.com), and social networking sites (ex. Facebook and Twitter). Please rate the extent to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know / Not sure
15 We have substantial experience with unsolicited online product feedback.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16 Our senior management sees value in collecting unsolicited online product feedback.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17 We have a specialized team that collects unsolicited online customer feedback.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18 We collect unsolicited online product feedback from various sources.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19 We reward our employees for discovering valuable unsolicited online product feedback.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Unsolicited Online Product Feedback Usage

Next set of questions provides information on the nature of unsolicited online product feedback usage in product development.

20. What benefits is your business expecting to obtain from using unsolicited online product feedback for product development? (Check all that apply)
- Access to additional ideas
 - Greater variety of ideas
 - More accurate assessment of quality
 - Less expensive than traditional sources of feedback such as focus groups
 - Data analysis process can be automated
 - Other (Please specify) _____
21. What benefits is your business actually obtaining from using unsolicited online product feedback for product development? (Check all that apply)
- Access to additional ideas
 - Greater variety of ideas
 - More accurate assessment of quality
 - Less expensive than traditional sources of feedback such as focus groups
 - Data analysis process can be automated
 - Other (Please specify) _____
22. What barriers is your business experiencing in using unsolicited online product feedback for product development? (Check all that apply)
- Uncertainty of benefits
 - Too complicated
 - Too expensive
 - Already satisfied with traditional sources of feedback such as focus groups
 - Competitors have access to the same information
 - Other (Please specify) _____
23. Rank these sources of unsolicited online product feedback from most to least valuable in providing useful feedback for product development.
- Virtual communities (ex. Reddit)
 - Blogs/vlogs (ex. Huffington Post/YouTube)
 - Product reviews on online retailer sites (ex. Amazon)
 - Social networks (ex. Facebook)
24. Rank these uses of unsolicited online product feedback from most to least valuable.
- Generating product improvement ideas
 - Generating new product ideas
 - Monitoring the quality of existing products
 - Monitoring the customers' satisfaction with products
 - Replying to customer' questions or concerns

Please state the extent to which your business uses unsolicited online product feedback to....

	We use unsolicited online product feedback to ...	Not at all	A little	A moderate amount	Quite a bit	Extremely	Don't know / Not Sure
25	... improve <u>existing</u> products.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	... develop <u>brand new</u> products.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	... monitor the quality of products.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	... monitor the customers' satisfaction with products.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Process Success

These questions examine, on average, the effectiveness of the product development process. Please rate the extent to which the following statements are true.

		Not at all	A little	A moderate amount	Quite a bit	Extremely	Don't know / Not sure
29	We develop our products rapidly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	We develop our products within budget.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31	We develop our products on schedule.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32	Our product development process is innovative.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Product Success

These questions examine, on average, the success of the products that are sold to and used by customers. Please rate the extent to which the following statements are true.

		Not at all	A little	A moderate amount	Quite a bit	Extremely	Don't know / Not sure
33	Our products achieve high customer ratings.	<input type="radio"/>					
34	Our products achieve higher market share than our closest competitors' products.	<input type="radio"/>					
35	We develop products that meet customers' quality expectations.	<input type="radio"/>					
36	Our products generate a positive return on investment.	<input type="radio"/>					

Compensation

37. If you would like to receive a summary of the findings, please write your email address in the comment box below (this would link your email to your responses). Alternatively, you can contact me directly at: din.begovic@carleton.ca using the subject line “UOPF Survey Findings”.

38. If you would like to enter the draw for one of three \$25 Starbucks Gift cards, please write your email address in the comment box below (this would link your email to your responses). Alternatively, you can contact me directly at: din.begovic@carleton.ca using the subject line “UOPF Survey Gift Card Draw”.

Appendix H: Measurement Item Mappings to Research Questions

Table 33: Mapping of research questions to survey questions.

Research Questions	Relevant Survey Questions
To what extent are product development organizations in the consumer electronics industry integrating UOPF into their product development process?	15-19
How are product development organizations using UOPF in product development?	24-28
What benefits are product development organizations expecting to obtain from integrating UOPF into their product development process?	20, 21
What barriers are product development organizations encountering with integrating UOPF into their product development process?	22
Do product development organizations show preferences for specific sources of UOPF?	23
Do customer orientation and cross-functional integration impact on product development success in the consumer electronics industry?	7-14, 29-36
Does UOPF exert both a direct and an indirect influence on product development success?	7-19, 29-36
Are there differences in how marketing and R&D managers perceive the role and impact of UOPF on product development?	7-19, 29-36
Are there differences in how organizations with less than 1000 employees and 1000 or more employees perceive the role and impact of UOPF on product development?	7-19, 29-36

Appendix I: Mahalanobis Distance

Table 34: Mahalanobis distance and chi-square values for all completed surveys.

Response	Mahalanobis Distance	Chi-Square	Response	Mahalanobis Distance	Chi-Square	Response	Mahalanobis Distance	Chi-Square
1	86.7270	0.000	71	22.4265	0.611	141	13.0151	0.976
2	62.8877	0.000	72	22.3037	0.618	142	12.7922	0.978
3	57.0768	0.000	73	22.1184	0.628	143	12.6828	0.980
4	55.3765	0.000	74	21.9668	0.637	144	12.5264	0.981
5	54.7905	0.000	75	21.8458	0.644	145	12.4332	0.982
6	50.5011	0.001	76	21.7797	0.648	146	12.3961	0.983
7	50.0289	0.002	77	21.6072	0.658	147	12.3009	0.984
8	47.7457	0.004	78	21.5082	0.664	148	12.2218	0.984
9	46.0822	0.006	79	21.4473	0.667	149	11.9492	0.987
10	46.0391	0.006	80	21.1979	0.681	150	11.8165	0.988
11	45.6701	0.007	81	21.0641	0.689	151	11.7717	0.988
12	45.5406	0.007	82	21.0086	0.692	152	11.4408	0.990
13	45.3665	0.007	83	20.9268	0.696	153	11.4366	0.990
14	44.4521	0.009	84	20.8364	0.701	154	10.8152	0.993
15	44.3727	0.009	85	20.7637	0.705	155	10.6688	0.994
16	43.3174	0.012	86	20.7073	0.708	156	10.6521	0.994
17	43.0133	0.013	87	20.6672	0.711	157	10.5324	0.995
18	42.4181	0.016	88	20.4262	0.724	158	10.4744	0.995
19	41.2949	0.021	89	20.3680	0.727	159	10.4703	0.995
20	40.7042	0.024	90	20.2867	0.731	160	10.0733	0.996
21	39.5832	0.032	91	20.2005	0.736	161	9.9534	0.996
22	39.4085	0.033	92	19.7451	0.760	162	9.8689	0.997
23	39.3377	0.034	93	19.4269	0.776	163	9.8523	0.997
24	39.1399	0.035	94	19.3527	0.779	164	9.8101	0.997
25	38.8106	0.038	95	19.2428	0.785	165	9.7608	0.997
26	38.1301	0.044	96	19.1778	0.788	166	9.7346	0.997
27	37.3292	0.053	97	18.7716	0.807	167	9.6067	0.997
28	36.4051	0.065	98	18.7068	0.811	168	9.6034	0.997
29	36.0338	0.071	99	18.5676	0.817	169	9.4149	0.998
30	35.7781	0.075	100	18.4799	0.821	170	9.3702	0.998
31	35.5071	0.079	101	18.4692	0.821	171	9.2811	0.998
32	35.4256	0.080	102	18.3719	0.826	172	9.1982	0.998
33	34.5701	0.096	103	18.2529	0.831	173	9.1683	0.998
34	33.6773	0.115	104	18.1448	0.836	174	9.0105	0.998
35	33.6301	0.116	105	17.9843	0.843	175	8.8876	0.998
36	33.2585	0.124	106	17.7369	0.853	176	8.8066	0.998
37	33.1648	0.127	107	17.6328	0.857	177	8.6974	0.999
38	31.8774	0.161	108	17.5642	0.860	178	8.6879	0.999
39	31.7131	0.166	109	17.3730	0.867	179	8.6677	0.999
40	31.1499	0.184	110	17.1557	0.876	180	8.5903	0.999
41	31.0705	0.186	111	17.1167	0.877	181	8.4548	0.999

Response	Mahalanobis Distance	Chi-Square	Response	Mahalanobis Distance	Chi-Square	Response	Mahalanobis Distance	Chi-Square
42	30.8578	0.193	112	17.0382	0.880	182	8.4287	0.999
43	30.5176	0.205	113	16.8897	0.885	183	8.3850	0.999
44	30.1067	0.220	114	16.7674	0.890	184	8.2409	0.999
45	28.8414	0.270	115	16.6728	0.893	185	8.2238	0.999
46	28.3018	0.294	116	16.4629	0.900	186	8.1117	0.999
47	27.6114	0.326	117	16.1783	0.909	187	8.0657	0.999
48	27.5924	0.327	118	15.5679	0.927	188	7.9576	0.999
49	26.7529	0.368	119	15.5005	0.928	189	7.7971	0.999
50	26.5805	0.377	120	15.3863	0.931	190	7.2372	0.999
51	26.1951	0.397	121	15.2438	0.935	191	7.1886	0.999
52	25.9966	0.407	122	15.1981	0.936	192	6.8108	0.999
53	25.8295	0.416	123	14.8350	0.945	193	6.6994	0.999
54	25.3815	0.441	124	14.5721	0.950	194	6.4427	0.999
55	25.2727	0.447	125	14.5532	0.951	195	6.1413	1.000
56	24.8608	0.470	126	14.4640	0.953	196	6.1122	1.000
57	24.5127	0.489	127	14.4526	0.953	197	6.0511	1.000
58	24.2826	0.503	128	14.3980	0.954	198	5.8231	1.000
59	24.1408	0.511	129	14.3160	0.955	199	5.4751	1.000
60	24.1084	0.513	130	14.1553	0.959	200	5.1674	1.000
61	24.0809	0.514	131	14.0852	0.960	201	3.3877	1.000
62	23.8290	0.529	132	14.0668	0.960	202	3.3877	1.000
63	23.7477	0.534	133	14.0435	0.961	203	3.3877	1.000
64	23.6246	0.541	134	14.0177	0.961	204	3.3877	1.000
65	23.5028	0.548	135	14.0025	0.961	205	3.3877	1.000
66	23.3830	0.555	136	13.8170	0.964	206	3.3877	1.000
67	23.2709	0.561	137	13.6204	0.968			
68	23.1526	0.568	138	13.4899	0.969			
69	23.0165	0.576	139	13.3872	0.971			
70	22.5953	0.601	140	13.1552	0.974			

Appendix J: Free-Text Responses on Integration Benefits

Question: What benefits is your business expecting to obtain from using unsolicited online product feedback for product development?

- Customer retention
- Measure of customer satisfaction
- How to improve existing features and identify new areas for development
- Overall product evaluation and service
- Faster collection of such information
- Uncovering customer pain points
- Define what the market needs and expects out of the company
- Increasing our long-term relationship with our customers
- Awareness
- How products are used
- Unsolicited online feedback regarding the product's impact on company brand as a proxy for solicited NPS scoring and questions.
- Helps validate primary research/data collection

Question: What benefits is your business actually obtaining from using unsolicited online product feedback for product development?

- Prioritization of tasks
- Customer retention
- Develop product communication strategy
- Helps to prioritize development efforts
- Overall product evaluation and service
- Faster collection of such information
- Translating those pain points into thoughtful product features
- Reaching more customers
- How products are used

Appendix K: Free-Text Responses on Integration Barriers

Question: What barriers is your business experiencing in using unsolicited online product feedback for product development?

- Small sample size and hard to aggregate.
- Feedback supplied by wrong customer personnel
- Unsure if the feedback is appropriate
- Limits the information on new growth areas
- Overall product evaluation and service provided to customer
- Sometimes this information can yield undesired results, based on an inaccurate assessment of an idea or particular data
- Non-representational feedback
- Understanding the use case that the customer is undergoing i.e. why did they experience that pain point and how
- Effort to filter through to determine appropriate priority of requests - for example, are these just a vocal minority of customer requests/complaints?
- Not enough data that would be useful for product development
- Sample size is uncontrolled and cannot be counted on. If we see only 4 feedback reviews and 3 of them with 5-star rating, can we believe our products are reasonably good quality. It may be completely misleading. Also, no guarantee when people will post feedback.
- Much of it is free-form text from a wide array on of sources/forums; hence, it's hard to accumulate and evaluate
- Knowing how to separate the wheat from the chaff.
- Biased or paid reviews and posts can be unreliable