

博士學位論文審査要旨

2018年1月17日

論文題目： New Understandings of Disruptive Innovation:
Micro- and Macro-level Studies
破壊的イノベーションの微視的・巨視的構造に関する研究

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審査委員：

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要 旨：

本論文は破壊的イノベーションの微視的・巨視的構造について論じたものである。本論文で明らかにしたことは以下のとおりである。

1) 1990年代後半に C. Christensen によって提唱され、現在の経営学における重要なテーマの一つになっている破壊的イノベーション理論について、それに対する批判も含めた先行研究を丹念に分析することにより、従来の Christensen らによる破壊的イノベーションに関する議論が、プロセスとしての破壊的イノベーションメカニズムと、結果としての破壊的イノベーションの成否を明確に区別しないまま行われてきたことが、破壊的イノベーション理論は現実のビジネスを説明できるものではないという批判につながっていることを指摘した。本論文では、その上で破壊的イノベーションにおける Christensen の最初の問題設定、すなわち、「何故よく管理された企業は失敗するか」という原点に立ち戻り、破壊的イノベーションを「性能改善」という微視的構造と「顧客ニーズの弾力性」という巨視的構造の二つの視点から再構築することを試みた。これが本研究の最も主張すべきオリジナリティである。

2) 1974年から2017年までに上市された91種類のパーソナル・モバイルコンピューティング関連製品について、そのイノベーションのタイプと市場に及ぼした影響を分析し、市場を破壊したようなイノベーションは、Christensen が主張している low-end disruptive innovation や new-market disruptive innovation だけではなく、Dosi の radical innovation や Henderson and Clark の architectural innovation、Moore の discontinuous innovation、Chesbrough の open innovation といった違うタイプのイノベーションも同様に市場を破壊したことを明示するとともに、Christensen が破壊的イノベーションを議論する際にイノベーションの生産物である「価値」ではなく、技術的な指標である「性能」を用いたことが彼の主張を弱めていることを指摘するとともに、イノベーションを受け入れる顧客から見た「価値」を指標とした新しい破壊的イノベーションのモデルを提示した。

3) 性能改善という微視的な破壊的イノベーションについては、Sahal のテクノロジーライフサイクルとイノベーションのアーキテクチャを結合することにより、そのメカニズムを説明できることを示した。

4) さらに Rogers のテクノロジーの普及に関するライフサイクル理論を破壊的イノベーションの視点から再定義し、「新市場の創造」、「市場のメインストリーム化」、「市場のコモディティ化」という3段階の顧客ニーズに基づく巨視的モデル化ができることを示すとともに、前項の微視的モデルと結合させた破壊的イノベーションの統合モデルを提案した。

本論文で提示した破壊的イノベーションに関する統合モデルは、破壊的イノベーションの提唱者である Christensen と彼のフォロワーグループとは全く異なる視座を与える研究であると評価できる。学会でも高く評価されており、2017 年に開催された国際会議 International Conference on Innovation, Management and Industrial Engineering (IMIE 2017)において Outstanding Paper Award を受賞している。また、実学的な観点からも、破壊的イノベーションの評価指標として「価値」を導入したこと、さらに破壊的イノベーションの重要なドライバーである Value Proposition と Value Acceptance の Gap を評価するために「顧客ニーズの弾力性」という新しい概念を導入したことは企業の新製品や新サービスのマーケティング活動に新しい視点を提供しうるものとして高く評価できるものである。

よって、本論文は、博士（技術・革新的経営）（同志社大学）の学位を授与するにふさわしいものであると認められる。

総合試験結果の要旨

2018年1月17日

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要 旨：

○総合試験実施日と時間：

2018 年 1 月 13 日 13:30～14:30

○専門分野に関する評価：公聴会における質疑応答および文書質疑により実施

質疑内容と評価：以下に示したように各質問に的確に回答しており、合格と判断する。

(1) 本研究の学術的価値は何か？

・本研究の学術的価値は、Christensen の破壊的イノベーションのミクロとマクロな構造, ならびに Rogers の技術進化過程と Sahal の技術普及のライフサイクル理論を統合したところにある。また、Moore の提唱した Chasm 理論と破壊的イノベーションの関係についても明快な説明を与えたことも成果の一つと考えられる。

(2) 本研究の実用的価値は何か？

・Christensen はイノベーターのジレンマに対する対応策を提案しているが、これは企業のおかれた状況依存性の高いアドホックなものでしかない。本研究は破壊的イノベーションの発生メカニズムを詳細に解明する中で、破壊的イノベーションの評価指標として「価値」が重要であること、さらに破壊的イノベーションの重要なドライバーである “Gap between Value Proposition and Value Acceptance” を評価するために「顧客ニーズの弾力性」という新しい概念を導入し、これらによって企業の新製品や新サービスのマーケティング活動に共通的な視点を提供できることを示した。この知見は、企業が破壊的イノベーションの脅威を防ぐだけでなく、破壊的イノベーションを競争相手に仕掛ける際の戦略策定にも資するものである。

(3) 本研究では主にコンピュータ関連のハイテク産業を事例として扱っているが、ここでの知見は他の産業にも適用されるか。

・本研究で取り扱った主な事例はパーソナル・アンド・モバイルコンピューティング産業である。また、付随的にディスクドライブ業界や半導体業界についても分析を行っている。これらの産業や業界は技術進化が速く、また業界内の競争も激しい業界であるが、破壊的イノベーションを含

めたイノベーションの発生メカニズムはそのような要因とは独立のものである。他の産業や業界、たとえば農業のような1次産業でも新しい耕作方法や農薬の使用・不使用、流通プロセスの変化等、ここで指摘したミクロ・マクロレベルでの破壊的イノベーションが起こっており、その様な産業分野でのイノベーションすなわち価値創造活動においても本研究の成果は生かしているものと考えている。

（４）本研究の最後に述べられている経営アドバイスのセクションの、論文全体の中での位置付けは何か？

- ・この経営的なアドバイスの目的は、最近 Christensen や彼のフォロワーグループの “Job to be done” という概念に基づく Disruption 2.0 という考え方についての批判的な見方を提示したものである。

○語学試験（対象となった語学名を含む）の内容

- ・母国語はスペイン語である。
- ・第2外国語である英語については、TIM専攻における英語科目を受講し良好な成績で単位を取得しているのに加え、査読付きの国際論文誌、国際会議における英語論文発表の実績もあり、博士号にふさわしい語学力を有する。
- ・また、日本語での講義受講が可能なレベルの日本語能力も有する。

よって、総合試験の結果は合格であると認める。

博士学位論文要旨

論文題目： New Understandings of Disruptive Innovation: Micro- and Macro-level Studies

破壊的イノベーションの微視的・巨視的構造に関する研究

氏 名： Montoya Juan Sebastian

要 旨：

This thesis is a comprehensive study about disruptive innovation, its patterns, and the mechanisms that cause it. This research tests Christensen's disruption theory, the main theory proposed today as an explanation of this phenomenon. In order to do so, this research identifies the strengths and weaknesses of Christensen's theory, and builds upon it to propose an improved theory of disruption that takes into account the differences between the micro and macro perspectives of disruption.

This research distinguishes between the characteristics of disruptive innovation, and the market effects of disruption itself. In the literature, these two aspects have often been treated interchangeably and thought to be the same, however the inconsistencies in disruption theory show that is worth questioning the link between disruptive innovation and actual disruption of the market. While the orthodox interpretation of disruption theory led by Christensen considers that the casual mechanism of disruptive innovation has been sufficiently demonstrated, the pluralistic interpretation of disruption theory considers that more research about fundamental aspects of disruptive innovation is still needed.

At the highest level of criticism, detractors have called for the complete abandonment of disruption theory. This thesis disagrees. Despite its problems, disruption theory is still one of the most powerful theories of innovation today. This research calls for a balanced review and test to the theory. Among the main assumptions of disruption theory that this research questions are: the possibility of self-disruption; the feasibility of high-end disruption; the casual mechanism of disruption, also known as the innovator's dilemma; and the value of other innovation typologies, besides disruptive innovation itself, to explain disruption.

To test disruption theory, this research conducted a quantitative and qualitative analysis of the personal and mobile computing industries as its two main case studies. In order to measure disruption in the personal and mobile computing industries, data for 91 product lines was collected,

including personal computers, smartphones, personal digital assistants (PDAs), tablets, and operating systems from 1974 to 2017. Special attention was given to the iPhone because of the challenges this product presents for disruption theory.

The methods employed in the statistical analysis were correlation using Spearman's coefficient, and binomial logistic regression. In total 20 dichotomous variables were analyzed, from those 12 are independent variables that represent characteristics of innovation, and 8 are dependent variables that measure market effects indicating whether disruption took place or not in reality.

Instead of relying exclusively on Christensen's concept of disruptive innovation, this research found that using other typologies of innovation improved the understanding of disruption. From several typologies of innovation, this research focused on six of them: 1) Christensen's low-end disruptive innovation, 2) Christensen's new-market disruptive innovation, 3) Dosi's radical innovation, 4) Henderson and Clark's architectural innovation, 5) Moore's discontinuous innovation, and 6) Chesbrough's open innovation.

This research found that Christensen was right in identifying the phenomenon of over-serving customer needs, and the opportunity that these gaps create for technologies that lower performance, or shift the basis of competition. However, Christensen was wrong in believing that this phenomenon was irreversible and that companies were blind to it. In most cases, over-serving gaps were only temporal, and both entrants and incumbents alike had the ability to adapt by lowering their offer of performance, or by introducing innovations that transformed unused performance into customer value.

This research coined the concepts of 'trickling of performance offer', and 'elasticity of customer needs' to improve the understanding of innovations that lower performance in the short term, but do not necessarily result in disruption. The trickling of performance offer describes *"the gradual adjustment of the performance offered by companies in order to adapt to the performance demanded by customers, especially when customer needs are less demanding than what state of the art technology could offer."* And the elasticity of customer needs describes *"the responsiveness of the performance demanded by customers to a change in the performance offered by companies, especially when new value is created."*

The concepts of elasticity of customer needs, and trickling of performance study two different, but interrelated phenomena. The feedback cycle between these two phenomena is what makes the market be more stable than the catastrophic predictions often found in disruption theory. This explains the ability of many incumbent companies to adapt and avoid being disrupted by the vast number of innovations that lower performance or shift the basis of competition in the market.

These innovations were found to be more common in the computing industry than disruption theory suggests, thanks to Moore's law.

Correlation and regression analysis gave Christensen's theory a good score. However, they also revealed an important weakness. New market disruptive innovation, low-end disruptive innovation, worse performance, and shifting the basis of competition, all these variables were found to have a significant correlation with market disruption. These positive results stand in stark contrast with the lack of significant results for the variable identifying whether a company was a new entrant or an incumbent. Being an entrant had no significant effect in the likelihood of developing disruptive innovations or succeeding at them. The qualitative evidence backed up this finding.

This finding does not completely invalidate disruption theory. However, the distinction between entrants and incumbents is a fundamental aspect in the causal mechanism of disruption proposed by Christensen, called the innovator's dilemma. If being an entrant does not contribute significantly to disruptive innovation, then the causal mechanism of disruption needs to be reexamined, as well as the advice offered by Christensen as a solution to the innovator's dilemma. This research found that competition in developing disruptive innovations is not restricted to incumbents versus entrants, competition takes place among all participants in the market.

This research also identified the elusive concepts of self-disruption and high-end disruption in the personal and mobile computing industries. While quantitative and qualitative evidence was found for self-disruption, only qualitative evidence was found for high-end disruption. This research found that companies can perceive disruptive threats to their products and often try to preempt them by self-disrupting. On the other hand, examples of high-end disruption were rare, and high-end products tended to fail in the market. In this case, this research found that high-end disruption was exceptional, at least in the computing industry.

Despite the good score of disruptive innovation in the statistical analysis, even more important was the finding that other types of innovation were also good predictors of disruption and the market effects often associated with it. Radical innovation, architectural innovation, discontinuous innovation, and open innovation can complement disruptive innovation, and often explain market effects that disruptive innovation is not well suited for. This comparative approach offered better results than the agnosticism of Christensen's theory towards other innovation typologies.

As expected, low-end disruptive innovation and new market disruptive innovation were found to be good predictors of the general effects of market disruption. However, this research found that the effects of market disruption were better understood by breaking them apart into three discrete market effects: 1) market creation, 2) market mainstreamization, and 3) market commoditization. This helped to identify more distinctive patterns between market effects and innovation types.

In the analysis of disruption from a macro perspective, this research found that these three discrete market effects act as market phases in Rogers' technology adoption life-cycle. Each market phase corresponds with a different pattern of innovation: 1) radical innovation and new market disruptive innovation contribute to the development of 'market defining radical innovations', which are the basis of market creation; 2) architectural innovation contributes to the emergence of a dominant design, which in turn is necessary for crossing Moore's chasm and achieving market mainstreamization; and 3) low-end disruptive innovation, especially efficiency innovations, reduce costs and get rid of inefficiencies, which results in market commoditization.

In the analysis of disruption from a micro perspective, this research coined the concept of 'anticipation of the technology life-cycle' and applied it to the study of Sahal's technology life-cycle. The anticipation of the technology life-cycle describes "*the adoption of new technologies earlier than optimal in order to get ahead of competitors.*" This finding represents an improvement over Christensen's assumption that incumbent companies are always blind-sided by technologies developed in different markets. The study of the micro perspective of disruption can also be understood as this research's original proposal of an alternative causal mechanism of disruption.

The technology life-cycle, and the technology adoption life-cycle help to clarify the level of analysis of disruption. Both cycles take place simultaneously, although on completely different scales. A product category experiences several technology life-cycles through the duration of the much longer technology adoption life-cycle. This creates multiple opportunities for anticipating the technology life-cycle, especially in the transitions between market phases, and each market phase supposes a different kind of risk of disruption.

The result of this research represents a considerable advancement in comparison to Christensen's theory thanks to the use of a consistent unit and level of analysis. The result is an original model that takes into account the micro and macro perspectives of disruption. The level of development of this model is complete to the point that it can be used to study not just one market, but also the overlap between two markets.

Any contribution to the understanding of disruption theory can only be assessed in the light of where the theory stands today. Nowadays, disruption theory is a powerful, but incomplete theory. This research agrees with Christensen's opinion that building a theory of disruption is an ongoing process, but disagrees with his premature conclusion that all that remains to be done is to deal with anomalies. This research made fundamental improvements to the understanding of disruptive innovation that demonstrate the potential of rethinking disruption theory.