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THE IMPACT OF THE E-COMMERCE BY-PRODUCTS SALES ON THE COMPANIES' DEVELOPMENT

The aim of this study was to identify the impact of by-products that are sold through e-commerce on the companies' development. The research focuses on the behavior of end consumers (individuals) within the online shopping industry, for instance e-commerce, game production companies. The research objectives were to provide information about by-products of the existing e-commerce companies that will make new startups in the future, about online game producers and similar products, which are the main subject for all kinds of shopping on the internet. The authors also discussed the sales performance of the treatment store that shifted to a substitute-based assortment organization. The authors studied the experience of scientists, who used a virtual reality experiment to explore the moderating impact of the shopping goal specificity on consumer purchases.

Keywords: *by-products, e-commerce, company, virtual reality, consumer purchases, complement-based assortment, game producers.*

JEL classification: F1, O24

Statement of the problem. According to Sammut-Bonnici T., McGee J. and Avgeropoulos S. [1], complementary products or services can be used in combination. In general, complement is of limited value when used alone, but when used together it increases its overall utility. Examples of supplements include cars and floors, tablets and apps, printers and ink cartridges. Complementarity is of secondary strategic importance to substitution. However, the addition raises questions in the company's field of activity. Firms that produce complementary goods have to make many decisions, especially with regard to control of complementary products and industries, pricing, and joint selling (bundling) of complementary goods. There are numerous advantages that can be gained through active engagement and management of complementary products. These benefits include the ability to achieve economies of scale in marketing, as the demand for one product will also increase the demand for its complementary counterpart. Additionally, the coordination of logistics and other shared activities can be streamlined when complementary goods are under the same control. By examining the relationship between these complementary goods, it becomes possible to anticipate changes in demand for one product based on fluctuations in demand for the other. Furthermore, if the price of one commodity experiences a rise or fall, it is expected that the demand for the complementary commodity will also be impacted, as both goods are typically used in conjunction with one another. These

interdependencies can be particularly valuable for capacity planning purposes, especially in cases where a company has control over only one of the complementary goods.

Analysis of recent research and publications. Brandenburger A. and Nalebuff B. [2] show how complements play an important role in analyzing a competitive environment and provide rich insight on how Porter brings together the roles of substitutes and complements in his five forces and their analysis. Insightful comments. In their analysis of the video game console industry's and Nintendo's ability to generate a win-win situation, they use a game theory approach to modeling.

Venkatesh R. and Kamakura W. [3] examined the most advantageous pricing methods for complementary products within a monopolistic market, taking into account various sales strategies. They also examine the effects of marginal cost levels and complementarity on three different pricing strategies: pure unit pricing, pure bundle pricing, and mixed bundle pricing.

Chris M. [4] studied the price of complementary products and the bundling of advertising investment based on the linear price elastic demand function. The study finds that if price discounts are sufficient to attract customers and the products are sufficiently complementary, advertising while implementing a bundling strategy can improve a firm's operational performance. Kwon J.H. [5] created a competition model between firms with multiple complementary products and firms with a single product to study hybrid bundling strategies among firms.

Halmenschlager C. and Mantovani A. [6] examine the impact of pooling on firm and social welfare. The conclusions show that although the mixed bundling strategy of complementary products induces a prisoner's dilemma, it is still the dominant strategy of multi-product firms, and social welfare can be maximized if the cost savings brought about by bundling are large enough.

According to Shao L. and Liu Q. [7], the rise in environmental consciousness among both consumers and businesses has led to the prominence of green production and green consumption as a significant socio-economic focus. Simultaneously, companies have recognized the market for complementary products as a crucial avenue for gaining a competitive edge.

Since no scientific article has historically described the financial contribution of by-products to today's e-commerce companies, online gaming companies, companies producing mobile applications, or even individuals who sell them personally, such a scientific article is attributed to us and we anticipate that the topic will be discussed in future. Frequently play a role in online buying and selling policies.

Objectives of the article. To provide information about spin-offs, existing e-commerce companies, e-commerce companies that will create new start-ups in the future, manufacturers of online games and similar products, which are the main topics for all types of Internet shopping. *The main objective of the study* is to determine the impact of by-products sold through e-commerce on company growth.

Summary of the main research material.

In manufacturing, a by-product is "the output of a common manufacturing process that is smaller in volume and/or net realizable value (NRV) than the main product". As by-products are not expected to have any impact on reported financial results, by-products will not receive a common cost allocation. By-products are also not listed by convention, but the NRV for by-products is usually recorded as "other revenue" or a reduction in processing costs that are co-produced when the by-product is produced. By-products are secondary products resulting from production processes, manufacturing processes, or chemical reactions. It is not the primary product or service produced.

By-products can be useful and marketable, or they can be considered waste: For example, bran, a by-product of wheat milling into refined flour, is sometimes composted or incinerated for disposal, but sometimes it may be used as waste. Nutrients in food for human consumption or for animal nutrition. Gasoline, once a by-product of oil refining, has since become an ideal commodity for motor fuel. The plastic used in plastic bags is also a by-product of oil refining. The International Energy Agency (IEA) defines by-products in the context of life cycle assessment, defining four different types of products: "Main product, by-product (bringing similar revenue to the main product), by-product (resulting from it. reduction) and waste (generating little or no revenue)."

Taking into account complementary product supply chains, and taking into account consumers' environmental awareness and green subsidies provided by the government, her paper examines members' choices among four game-theoretic contract models. In practice, with the refinement

and globalization of consumption and production, the role of product complementary strategy is becoming more and more important, and product complementary supply chain has become an important process of enterprises. Apple eventually captured 70% of the U.S. MP3 market with iTunes, the world's largest music store, a highly effective add-on to its base product, the iPod, launched in 2001. The well-known German camera brand Leica decided to cooperate with Huawei in 2016, trying to cope with the general downturn in the camera industry by changing its previous product strategy and leveraging complementary advantages.

By recognizing the needs and desires of their customers, IKEA skillfully established a connection between two seemingly unrelated areas: furniture and catering. In their research, they thoroughly examine the decision-making processes involving price and green innovation in the supply chain of complementary products, specifically in scenarios where government green subsidies are provided to retailers. As a result, it can be concluded that in the context of advancing the green economy, more and more companies are being encouraged to embrace green innovation and prioritize green supply chain management. Prominent examples of this include Huawei, HP, Apple Inc, and Procter & Gamble. Conversely, the intensifying competition within the market has also brought increased attention to the strategies surrounding complementary products and the management of their supply chains. However, due to the spill-over effect of green innovation, complementary products undoubtedly play a crucial role in the development and progression of the green economy.

However, theoretically, few studies have addressed green complementary supply chain decisions and contracts. According to the results, the main findings are as follows. First, the government's green subsidies and environmentally conscious green consumers in both centralized and decentralized supply chains of complementary products (under all contracts) encourage manufacturers to increase the ecology of complementary products, which play a very positive role in environmental protection. In terms of the market, consumers' awareness of environmental protection can also prompt manufacturers to improve the environmental protection level of complementary products (Figure 1).

Furthermore, the level of incentives for the government and consumers increases with utility spillovers between complementary products. Therefore, in the process of carbon peaking and carbon neutrality, governments and supply chain leaders can use product complementary strategies to improve the efficiency of green innovation, for example, by actively managing consumers' green consumption to generate complementary green spillover effects. product. Second, compared with wholesale price contracts, revenue and cost sharing contracts can not only motivate manufacturers to increase supply chain ecology and subsidize product ecology, but also achieve Pareto improvement of supply chain members, provided that contract performance parameters are reasonable and conducive to supply Chain optimization, while the revenue sharing agreement is more effective.

Carliss Y. Baldwin [8] wrote that complements have greater value when used together than individually, and they can be strong or weak. Power supplements are specific

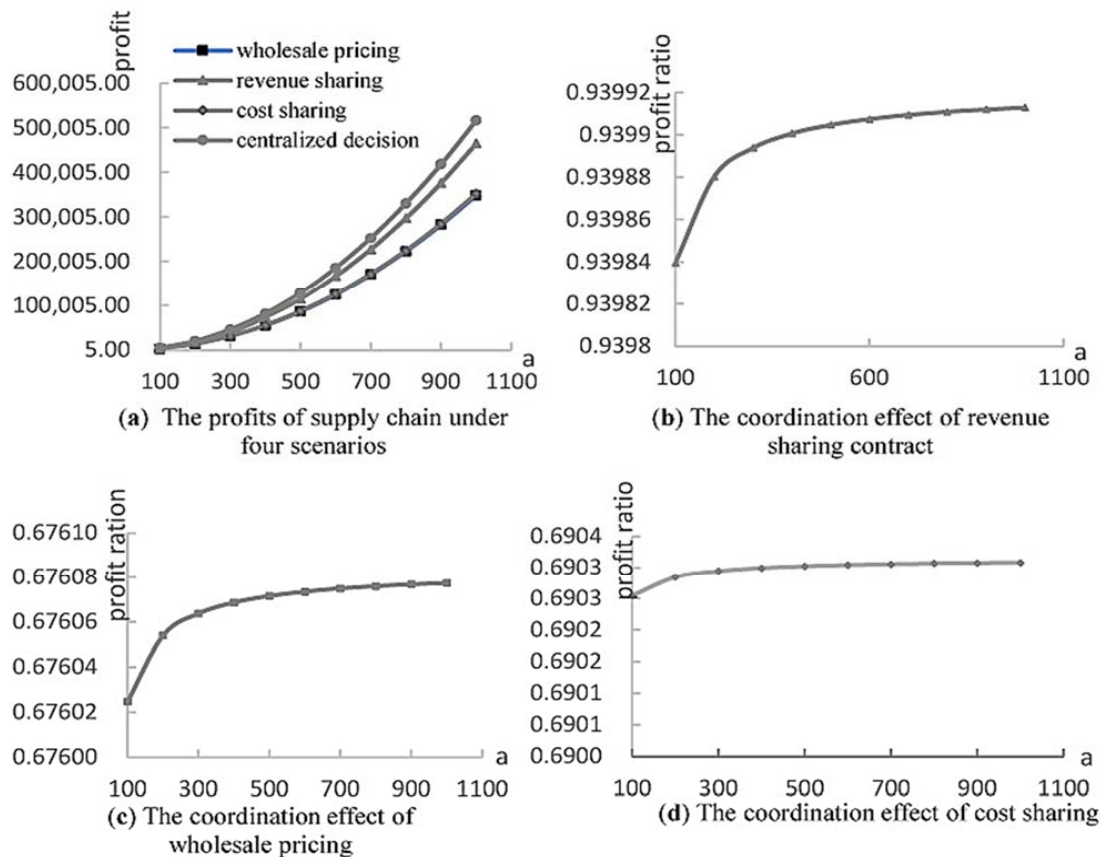


Figure 1 (a, b, c, d) – The effects of the consumers’ environmental awareness on the encouragement of manufacturers to improve the green degree of the complementary products

Source: developed by the authors

and unique commodities with no value (or are of much reduced value) unless they are all put into use. In task networks, there is strong complementarity due to dense technological dependencies. This can also occur for other reasons. Transaction Cost Economics and Property Law Theory suggest a strong complement to the assumption of unified governance, for example through shared ownership.

According to agency theory, the concept of weak complementarity can be effectively addressed through arms-length transactions and contractual agreements. On the other hand, supermodular complementarity occurs when an increase in the quantity of one input leads to a higher value for another input. Distributed supermodular complementarity (DSMC) occurs when independent actors can create complementary value by pursuing their own interests, and it is not advantageous for them to combine forces in order to coordinate their actions. The authors has established formal conditions that determine when DSMC is consistently observed in a dynamic equilibrium. With the presence of DSMC, clusters of firms that produce different complementary goods, including open platforms and their surrounding ecosystems, can thrive and effectively compete against integrated firms that have control over all complementary inputs.

Sarantopoulos P., Theotokis A., and Roggeveen Anne L. [9] investigating whether and why organizing product categories according to the consumption objectives they serve (i.e. supplement-based taxonomic organization)

increases purchases compared to organizing product categories. According to their attributes or physical characteristics (i.e. alternative taxonomy design). The authors show through two field experiments (a virtual reality experiment and a laboratory experiment) that supplement-based assortment organization leads to increased purchase volume and higher costs compared to alternative-based assortment organization. Simple visualization of the consumption process communicates the results. The effect of complementarity-based organization on purchases was more pronounced among less engaged consumers and those with less specific shopping goals.

The implications of these findings are significant in both theoretical and practical contexts. It is crucial for both online and physical retailers to prioritize the organization of their retail offerings in order to cater to the shopping requirements of consumers throughout their purchasing journey. One way to organize taxonomy is the complementary approach, where product categories are grouped according to specific consumption goals or usage contexts [10]. This organizational approach is also known as goal-oriented [11], consumption constellation-based [12] or procurement task-based [13].

Examples of retailers that use complement-based category organization are IKEA (“Bedrooms,” “Living Room,” “Kitchen”), Mango (“Office Wear,” “Weddings and Parties,” “Sportswear”), and Marks & Spencer (“Breakfast”, “Lunch”, “BBQ”). Taxonomic organization

based on complementarity can also convey meaningful information about the context in which the product is used [12]. Product categories and their complementary products (e.g., a sandwich surrounded by chips, dessert, and drink; a sofa surrounded by a coffee table and armchairs) are more descriptive representations of actual consumption or use processes. Vitality theory [14] showed that when people encounter life information, they will generate more images in their minds and imagine consumption [15]. By implementing a complement-based assortment

organization, there is a potential for an increase in unplanned attention towards nonlocal products, as they become more pertinent to consumers [17]. This increase in relevance may also lead to an increase in anticipated utility [18], as consumers are able to envision the products being utilized in conjunction with one another. Additionally, *Table 1* provides an overview of four studies and their primary discoveries.

In complementary varieties, complementary products are by definition physically close to each other, but the

Table 1 – The overview of four studies and main findings of the conditions of the complement-based assortment organizations’ positive impacts on purchase behavior

Study 1: Interrupted Time-Series with a Control Group; Setting: Field (Grocery); Sample: N = 1,112,652 Trip-Level (Anonymous) Transactions				
	Control Store (N = 532,896 Transactions Across 105 Weeks)		Treatment Store (N = 579,756 Transactions Across 105 Weeks)	
	Substitute-Based (20th Week Before the Intervention)	Substitute-Based (20th Week After the Intervention)	Substitute-Based (20th Week Before the Intervention)	Complement-Based (20th Week After the Intervention)
Number of items	12.23 (.22)*	12.42 (.48)	13.07 (.09)	15.48 (.13)
Number of SKUs	9.66 (.20)	9.75 (.44)	10.28 (.08)	12.34 (.12)
Number of categories	6.62 (.19)	6.58 (.42)	7.16 (.07)	8.99 (.11)
Expenditure (\$)	34.92 (.28)	35.36 (.60)	39.86 (.11)	43.69 (.16)
Main finding	Consumers make more purchases and exhibit higher expenditures when the store uses a complement-based assortment organization compared with a substitute-based assortment organization.			
Study 2: Mediation; Setting: Amazon Mechanical Turk (Furniture); Sample: N = 112, 40% Female, M _{age} = 35.52 Years				
	Substitute-Based (N = 56)		Complement-Based (N = 56)	
Number of items	11.55 (5.05)		13.70 (6.12)	
Ease of visualization	6.58 (1.73)		7.18 (1.36)	
Main finding	Ease of visualization of the consumption process mediates the effect of assortment organization on purchases.			
Study 3: Moderation; Setting: Field (Grocery); Sample: N = 237, 58% Female, M _{age} = 39.38 Years				
	Substitute-Based (N = 117)		Complement-Based (N = 120)	
	Low Involvement (JN - 1 SD) ^a	High Involvement (JN + 1 SD)	Low Involvement (JN - 1 SD)	High Involvement (JN + 1 SD)
Number of items	13.31 (.44)	15.77 (.84)	15.90 (.42)	16.02 (.81)
Number of SKUs	12.82 (.45)	15.35 (.83)	15.38 (.43)	15.56 (.79)
Number of categories	11.74 (.45)	14.49 (.86)	14.44 (.44)	14.69 (.82)
Expenditure (\$)	36.37 (1.17)	42.57 (2.07)	42.93 (1.12)	42.95 (1.98)
Main finding	Less involved consumers make more purchases and exhibit higher expenditures in response to a complement-based assortment organization compared with a substitute-based assortment organization. More involved consumers purchase similar amounts, regardless of the assortment organization.			
Study 4: Moderation; Setting: Virtual Store (Grocery); Sample: N = 160, 53% Female, M _{age} = 37.59 Years				
	Substitute-Based (N = 80)		Complement-Based (N = 80)	
	Specific Goal (N = 80)	Nonspecific Goal (N = 40)	Specific Goal (N = 40)	Nonspecific Goal (N = 40)
Number of items	9.05 (1.97)	9.23 (1.75)	10.63 (2.04)	12.48 (1.92)
Number of categories	7.95 (1.96)	9.53 (2.05)	8.13 (1.77)	11.38 (1.97)
Main finding	Consumers without specific shopping goals make more purchases in response to a complement-based organization compared with a substitute-based assortment organization. Consumers with specific shopping goals purchase similar amounts regardless of the assortment organization.			

^aPredicted values in Study 3 are obtained by evaluating the regression functions at the JN - 1 SD (low) and JN + 1 SD (high) involvement levels.

Notes: Standard errors (Studies 1 and 3) and standard deviations (Studies 2 and 4) are in parentheses.

Source: developed by the authors

beneficial downstream effects of complementarity (i.e., ease of visual consumption) are independent of this physical proximity. Instead, simpler visualizations can be achieved by using other elements of the retail mix that make it easier for consumers to "see" the end result, such as in-store advertising or signage. Thus, the authors predict that when consumers encounter complementary organized items, they imagine experiencing these products and consider products that complement the featured item, leading to more purchases.

The authors therefore conducted four studies and examined whether and under what conditions these complementary (see alternative) taxonomic organizations had a positive effect on purchasing behaviour.

Conclusions. This article uses the previous surveys of professional companies and the official financial reports of these companies to understand the financial contribution of supporting products to the e-commerce business. In addition, e-commerce businesses are explained, which are all types of individual businesses that make sales over the Internet.

Study 1, using field data and discontinuous time-series analysis with a comparable concurrent control group, examined vertical sales change and showed a significantly larger increase in average weekly purchases for supplement-based versus alternative-based assortment organizations, over four bars. The authors also compared the sales performance of therapeutic stores that switched to the supplement-based assortment organization to the projected sales of organizations that retained the

alternative-based assortment to ensure that the results were not due to novelty effects.

Study 2 details the mechanism of these effects in a laboratory setting and shows that simple visualization of the consumption process moderates the effect of assortment organization on purchase. By controlling for the number of products and categories across all conditions, this study also removed the possibility of an effect due to differences in the actual number of products or categories shown.

Next, Studies 3 and 4 examined the moderators of prediction: engagement and target specificity. These two factors predictably influence how well consumers experience is visualized, regardless of taxonomic organization. Using Study 3, a field study, they measured shopper engagement three months before and three months after a store transitioned from a replacement-based to a complementary assortment organization, and then examined by item and SKU, category, and sales to these shoppers. spend. The results suggest that for highly engaged consumers, the effect of complementarity-based categorical organization is reduced.

Finally, Study 4 examines the moderating effect of shopping goal specificity on consumer purchases through a virtual reality experiment and shows that specific shopping goals reduce the positive lift from supplement-based assortment organization. However, even shoppers with specific goals will still shop more in complementary category organizations than in alternative-based category organizations. These results illustrate the powerful effect of complementary arrangements of objects.

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ВПЛИВ НА РОЗВИТОК КОМПАНІЙ ПРОДАЖУ СУБПРОДУКТІВ ЧЕРЕЗ ЕЛЕКТРОННУ КОМЕРЦІЮ

Мета цього дослідження полягала в тому, щоб визначити вплив субпродуктів, які продаються через електронну комерцію на розвиток компаній. У цій статті використовуються попередні результати опитування та офіційні фінансові звіти компаній для визначення фінансового внеску допоміжних продуктів у бізнес у сфері електронної комерції. На основі чотирьох пілотних досліджень перевірено позитивний вплив на купівельну поведінку споживачів таксономічних організацій. Дослідження зосереджено на поведінці кінцевих споживачів (фізичних осіб), особливо в індустрії онлайн-торгівлі, зокрема, електронній комерції та компаніях з виробництва ігор. Цілі дослідження полягали в тому, щоб надати інформацію про субпродукти існуючих компаній електронної комерції, які створюватимуть в майбутньому нові стартапи онлайн-ігор та подібні продукти, які є основним предметом для всіх видів покупок у Інтернет. У статті обґрунтовано вплив державних зелених субсидій на процеси прийняття рішень, пов'язані з ціновими та екологічними інноваціями в ланцюжку постачання додаткових продуктів. Автори вивчили досвід вчених, які використали експеримент у віртуальній реальності, щоб дослідити пом'якшувальний вплив специфічних цілей покупок на попит споживачів. Зроблено висновок, що обізнаність споживачів щодо охорони навколишнього середовища також може спонукати виробників покращити рівень екологічного захисту додаткових продуктів. Автори розвинули дискусію щодо показників продажу магазину лікувальних засобів, який перейшов від організації асортименту до замінників. У результаті дослідження зроблено висновок, що в контексті розвитку «зеленої» економіки більшість компаній заохочуються використовувати «зелені» інновації та віддавати пріоритет «зеленому» управлінню ланцюгом поставок. Висловлено припущення, що організована торгівля субпродуктами, посилює емоційний ефект споживачів від покупки цих продуктів, які доповнюють представлений товар, що призводить до збільшення кількості покупок.

Ключові слова: субпродукти, електронна комерція, компанія, віртуальна реальність, споживчі покупки, комплементний асортимент, виробники ігор.