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From the old to the new generation of a product: unlearn, improve and prosper

Nikolaos Kyriakopoulos
Department of Design, Organization, and Strategy, Delft University of Technology, Delft, The Netherlands

Paraskevas C. Argouslidis and Dionysis Skarmeas
Department of Marketing and Communication, School of Business, Athens University of Economics and Business, Athens, Greece, and

Spiros Gounaris
Department of Marketing, University of Strathclyde Business School, Glasgow, UK

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Abstract

Purpose – Drawing on the theories of planned obsolescence and dynamic capabilities, this study aims to jointly address marketing and organizational aspects of the transition from the existing to the new generation of a product (i.e. a product rollover). It conceptualizes the relevance of organizational unlearning in rollovers and relates it to the improvement in the marketing mix of multigenerational products to predict product rollover performance.

Design/methodology/approach – The study reports on a cross-sectoral sample of 179 product rollovers among UK-based manufacturers of multigenerational products.

Findings – Organizational unlearning is indirectly associated with product rollover performance through the improvement in the marketing mix of the rollover. Environmental dynamism plays a moderating role.

Research limitations/implications – This study enriches the operations management-leaning rollover literature with evidence about the under-addressed marketing perspective of rollovers. Owing to its theoretical foundations, it makes the rollover literature more cross-disciplinary. Not considering additional product and environmental factors is among its limitations.

Practical implications – Firms whose products evolve through successive generations can boost rollover performance by deploying an organization-level dynamic capability (i.e. organizational unlearning), which promotes departure from encased knowledge, subject to the competence of channeling this capability in the marketing mix of multigenerational products.

Originality/value – To the best of the authors' knowledge, this study is the first to empirically address rollover marketing mix dynamics from the side of the firm, with underpinnings in economic and organizational theories.

Keywords Product rollovers, Planned obsolescence, Dynamic capabilities, Organizational unlearning

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Introduction

New product development (NPD) and product elimination are two key product management decisions. In manufacturing sectors where product evolution depends on product line filling and pruning, the two decisions are independent; developing a new variant does not require eliminating an existing one or vice versa (Avlonitis, 1990). For example, United Biscuits periodically develops new recipes to fill the McVitie's Digestive product line. But in manufacturing sectors where product evolution depends on generational successions, the two decisions are interdependent; developing a product's new generation requires the immediate or phased-out elimination of the existing generation (Saunders and Jobber, 1994). Illustratively, the development of a new generation of VW Golf and of Samsung Galaxy involves, respectively, the immediate and the phased-out withdrawal of the existing generation. This generational transition and the resulting interdependence between the two decisions are formally defined as a *product rollover* (Billington *et al.*, 1998).

It is important to clarify a key distinction from the outset. In line fillings, a new variant differs from existing ones in an attribute that characterizes the product category but is not an improved version of existing variants. In the McVitie's analogy, introducing a new white chocolate-coated biscuit fills the product line to accommodate additional consumer tastes. In doing so, the new variant neither aims nor claims to render the existing dark chocolate-coated biscuit inferior or obsolete. Conversely, in rollovers, the new generation must be an improved version of the existing one (Chen *et al.*, 2022; Ye *et al.*, 2020). In the Golf and Galaxy analogies, introducing the new generation, the manufacturer claims the inferiority and obsolescence of the existing generation. To justify this claim, the new generation must be substantially superior. The counterargument is that substantial improvements in rollovers are not universal; there exist cases with trivial or superficial improvements that enjoyed satisfactory (likely inertial) performance (Dayaram, 2021; Polanco, 2021). However, there also exist rollovers that were embraced with alacrity and left an indelible positive mark on the trajectory of the product, simply because they involved considerable improvements in the transition. One such example was the fifth generation of the VW Golf in 2003, which introduced superior core characteristics, shorter delivery times and the resourceful "*Un-Pimp Your Ride*" advertising campaign (Bleakney, 2019; Orlando Volkswagen North, 2015). Another such example was the Apple MacBook Pro 17.1 generation in 2020, featuring a significant core upgrade, a new pricing policy and an iconic promotional campaign (Evans, 2020; Jibilian, 2020).

Drawing on these, as well as other lesser-known substantive rollovers, we advance two propositions. First, rollover performance must be a function of making the new product generation substantially improved. We do not propose that the firm should reinvent the wheel; a degree of intergenerational continuity is important to preserve product identity (Saunders and Jobber, 1994). We propose that the modifications in a product's marketing mix should be such that the new generation is truly improved and not a façade (i.e. not the outcome of managers' urge to launch a new generation solely to attract public attention). For our present purposes, we use the term *marketing mix improvement* (henceforth MMI) to denote the relative improvement (or deterioration) of the new generation's marketing mix (i.e. product, price, distribution, promotion) compared to the previous generation. Second, achieving such an improvement requires a firm-level capability that inspires rollover teams to implement notable transitions. As an inducer of employees to refresh their cognitive structures and (when necessary) disengage from obsolete routines (e.g. Sharma and Lenka, 2022), we posit that *organizational unlearning* is prominent.

Because a rollover has operational and marketing aspects, pertinent literature tackles them both. Generally, the operational perspective prevails, while the marketing perspective is

under-represented and consumer-sided. Specifically, the rollover literature includes several operational papers, addressing three optimality aspects: (a) new generation pricing in relation to whether the existing generation is withdrawn immediately (i.e. single rollover) or phased out over time (i.e. dual rollover) (e.g. Koca *et al.*, 2010; Lim and Tang, 2006; Xu *et al.*, 2025), (b) rollover frequency (e.g. Bornemann *et al.*, 2020; Dacko *et al.*, 2008; Liao and Seifert, 2015) and (c) rollover inventory planning (e.g. Li *et al.*, 2010).

Most operational papers used theoretical optimization models and did not rely on primary empirical data. The literature also includes marketing papers, focusing mainly on the perspective of the consumer to (a) empirically address how cognitive or affective characteristics influence the intention to buy the new product generation (e.g. Bellezza *et al.*, 2017; Jung *et al.*, 2022; Xiao and Spanjol, 2021) or (b) develop models concerning how intergenerational price elasticities predict the tendency of switching to subsequent product generations (Danaher *et al.*, 2001). To the best of our knowledge, the only empirical marketing-oriented study that investigated the side of the firm is that by Saunders and Jobber (1994). Addressing the last phase of the rollover (i.e. the commercialization of the new and the elimination of the existing generation), the latter study identified alternative strategies for synchronized transitions (e.g. butt-on; roll-in/roll-out; downgrading; high season launch; low season switch; fudging) and developed a strategy occurrence typology, in relation to (a) the firm withdrawing the existing generation immediately vs. gradually after commercializing the new generation, (b) the extent of changes made to the new generation (facelift vs. neo-innovation), (c) the pricing strategy (skimming vs. penetration), (d) product seasonality and (e) the frequency with which the firm generally engages in a rollover.

Reverting to our two propositions, the overview of the rollover literature suggests that they remain unaddressed, despite their intuitive logic, academic significance and managerial relevance. No previous study has investigated the rollover in a way that directly, jointly and empirically addresses its marketing aspects, the perspective of the firm and organization-level factors that may influence MMI and, in turn, rollover performance. Specifically, this paper attempts three contributions. First, by directly associating a multigenerational product's marketing mix with rollover performance, it aims to strengthen the representation of the marketing perspective in the operationally-sided rollover literature and add to the marketing-oriented rollover literature new (and surprisingly missing) evidence about the role of the improvement in a multigenerational product's marketing mix. Second, by adopting the angle of the firm, it helps to redress the imbalance in the consumer-sided, marketing-oriented rollover literature. Third, by associating MMI and rollover performance with organizational unlearning, it aims to broaden the scope of the rollover literature, making it more cross-disciplinary in its theoretical underpinnings.

We propose that organizational unlearning is positively associated with MMI, which, in turn, is positively associated with rollover performance (i.e. sales, accounting, financial), particularly under high industry demand for change. We anchor this proposition on the theories of *planned obsolescence* (Swan, 1972) and *dynamic capabilities* (Teece *et al.*, 1997). We test our framework in a dataset of 179 rollovers among UK-based manufacturers of durable goods. In the ensuing sections, we elaborate on the theoretical foundations, formalize the hypothesized associations, present the methods, report the results, decode implications, unfold the limitations and advance directions for future inquiry.

Theoretical foundations

Planned obsolescence

The theory of planned obsolescence describes the policy of durable goods manufacturers to produce and sell product models with short useful lifespans, so that customers will have to

repurchase more often (Bulow, 1986; Swan, 1972). Although this policy appears to be uneconomical and socially nonoptimal (Packard, 1961), there is an incentive to practice it, which is driven by the time-inconsistency problem facing a manufacturer who sells output in each of two periods (Waldman, 1996). Because in the second period the manufacturer will internalize the positive effect of an attribute change on the higher value of the new output (but will not internalize the negative effect of his decision to sell the new output on the lower valuation of the output sold in the first period), his incentive to introduce new models that make old models obsolete is (a) too high and (b) above that which is considered socially optimal. Both in monopolistic and competitive market structures, manufacturers enjoy the flexibility to decide how often to introduce a new model. But while a monopolist internalizes the benefits of planned obsolescence by manipulating such easily controllable proxies as model durability and compatibility (Choi, 1994; Waldman, 1993), positive internalities in competitive structures are a primary function of an advanced R&D program (Grout and Park, 2005; Waldman, 2003).

The theory of planned obsolescence provides the overarching foundation for our conceptualization. If firms operated in monopolistic structures, rollover performance would be a mere function of controllable supply-side factors. Such a market structure privilege would turn firms uninterested in guarding against competition, as they could implement rollovers conveniently, force them on customers and still enjoy satisfactory performance. Nevertheless, few firms in a few sectors enjoy such a privilege. Undoubtedly, the intersectoral variation in product quality level, lifecycle stage of product concept and dynamism influences new model improvement rates (Dhebar, 1994). But primarily, firms operate in competitive market structures (even though they may not be perfectly competitive), where rollover performance is a more complex equation because the new model *must be superior* not only in title but also in substance. The analogy for the central role of MMI in our conceptualization is implicit in the economic terminology of Grout and Park (2005, p. 597 and p. 607): in a competitive equilibrium, customer demand following planned obsolescence "*may be greatest for the output of those firms that embark on an excessive R&D program*" and are able to prepare a new model with "*better attributes*" that give it "*value*" and "*make it sufficiently superior to those of a particular old model-type*".

Dynamic capabilities

The term *dynamic capability* has some bearing on the 1980s idea of the adaptive corporation, as popularized by Toffler (1985). The theory of dynamic capabilities explains that a firm's ability to build competitive advantage "*in regimes of change*" depends not solely on inherited scarce assets but also on unique and difficult-to-replicate resources (Teece *et al.*, 1997, p. 509). These resources are termed *dynamic capabilities*. They include micro-foundational structures, processes and skills that are of a higher level than "*the grammars of action*" (Pentland and Rueter, 1994, p. 489) and reflect an organization's ability "*to reflexively revisit what it routinely does*" (Felin and Foss, 2009, p. 162). Provided that the firm deploys them efficiently and effectively, dynamic capabilities enable the creation and protection of a new source of wealth and contribute to superior long-term performance (Eisenhardt and Martin, 2000; Teece, 2007). Moreover, owing to their transformative qualities, they can be more central to private wealth creation than strategizing, whereby incumbents try to raise entry barriers to potential newcomers or disturb the balance among existing rivals (Teece *et al.*, 1997). In the latter respect, dynamic capabilities are broadly reminiscent of Christensen's (1997) perspective that firms with fewer (but smartly managed) resources can successfully and disruptively challenge established incumbent businesses.

One such dynamic capability is *organizational unlearning*. It was initially introduced to counter the stereotype that, by opposing learning, organizing depends on conservatism and resistance to change. But it also questioned later perspectives on the value of continuous learning without unlearning (Hedberg, 1981; Hedberg *et al.*, 1976). Convergingly, unlearning denotes an organization's conscious and deliberate attempt to discard obsolete routines and adapt to changes in volatile and uncertain environments (e.g. Sharma and Lenka, 2022). Conceptually, unlearning has unique properties. First, there exists an implicit interplay with learning, but not always or necessarily. Learning can occur without unlearning (e.g. in newly established entities where there are no existing routines to be discarded) and unlearning can occur without learning (e.g. when the discarding of an existing routine does not need to be followed by a replacement) (Tsang and Zahra, 2008). Second, unlearning does not cancel the value of existing knowledge. As Nystrom and Starbuck (1984) suggested, organizations must learn continuously. However, when they learn without unlearning, they encase existing knowledge into their strategy and educate their members to use it routinely. As such, encased learning produces rigidity. McGill and Slocum (1993) suggested that if top management is to build a learning organization, it must first concern itself with unlearning the organization by discarding ossified routines that have outlived their usefulness. Sharma and Lenka (2022) noted that although organizations must continue to learn new knowledge, a portion of this knowledge will inevitably become ineffective. This, in turn, will lock employees in obsolete path dependencies and replicated decision patterns, unless the organization is willing to unlearn. Third, unlearning is both different from and superior to passive (i.e. accidental loss of existing knowledge due to disuse) and active forgetting (i.e. unquestioning deletion of every piece of existing knowledge) and is not subsumable under learning. It is a stand-alone impetus of change, which can be used continuously or deployed episodically to disengage organizations from dated routines that retard evolution and qualify bottom-line performance (Akgün *et al.*, 2007; De Holan and Phillips, 2004; Tsang and Zahra, 2008).

Investigating its antecedents and outcomes, scholars contextualized unlearning in different problems and various decision areas, such as crisis management (e.g. Sheaffer and Mano-Negrin, 2003), innovation and NPD (e.g. Lee and Sukoco, 2011; Lyu *et al.*, 2020; Mariano and Casey, 2015) and inter-organization knowledge transfer (e.g. Yildiz and Fey, 2010). For example, the external environment, an economy's institutional context (i.e. transitional vs. non-transitional) and an organization's age, governance structure and entrepreneurial orientation, are among the factors hindering or enabling unlearning (e.g. Akgün *et al.*, 2006; Klammer *et al.*, 2019; Tsang, 2008). But irrespective of the problem or decision area, literature converges on the beneficial outcomes of unlearning [1]. Based on the foregoing, the theory of dynamic capabilities points at organizational unlearning in the quest for a prominent firm-level climate that can inspire substantive MMI.

Hypotheses development

Figure 1 illustrates our conceptualization and the hypothesized relationships among model constructs. In addition to theoretical underpinnings, jointly considering organizational unlearning and MMI is also conceptually compelling. The two concepts share a similarity: a filtered departure from something old and a thoughtful embracement of something new. Unlearning represents an organization-level capability to deliberately abandon obsolete routines in a firm's *modus operandi* and to make room for new ones. MMI in the transition from the existing to the new generation of a product denotes a marketing decision-level manifestation of the above organization-level capability.

We noted from the outset (and will revert to this matter later) that rollovers generally involve improvement in the marketing mix of a product, in the transition from its old to its new model. The theory of planned obsolescence formalizes (and real-world practice concurs) that when product evolution depends on generational successions, the rollover prevails (Bulow, 1986; Waldman, 1993, 1996). It may occur with varying frequency (Dacko *et al.*, 2008), it can be single or dual (Koca *et al.*, 2010), but above all, it is recurring (Billington *et al.*, 1998). For a given product of a given manufacturer, rollover recurrence ferments economies of scale and other positive internalities. As the product evolves through successive generations, the manufacturer accumulates operational, technical and production know-how. However, rollover recurrence is not without risks. The accumulated learning may become encased, foster path dependencies and lock rollover teams in replicated, inertial and conformity-driven cognitive structures (Nystrom and Starbuck, 1984). This rigidity often leads to a transition with little attention to marketing mix dynamics. Manufacturers are often criticized for their policy of launching a new generation that emphasizes cosmetic changes over substantive improvements (Dixit, 2023). Is there a *modus operandi* that allows rollover teams to avoid trivial transitions in terms of MMI? As a dynamic capability, unlearning has a promising role. An unlearning-friendly climate does not disconnect managers from the valuable practices of the past, does not push them to passively or actively erase a product's history and identity and does not neutralize economies of scale, accumulated know-how and other positive internalities. It enables managers to use their memory and learned experience synthetically and evolutionarily, but without being constrained by past rollover routines, which, although they were effective in previous product generations, are unlikely to improve the next generation (McGill and Slocum, 1993; Tsang and Zahra, 2008). In short, unlearning should grant rollover teams authority and freedom to endow the next generation of a product with a superior marketing mix. Formally, the following hypothesis is proposed:

H1. Organizational unlearning is positively associated with MMI.

Marketing mix considerations are important to both product line fillings and rollovers. But there is a fundamental difference in how they matter. When intertemporal product category progress depends on fillings, the manufacturer periodically complements the existing product line with new variants (Keller and Aaker, 1992; Reddy *et al.*, 1994). Given that

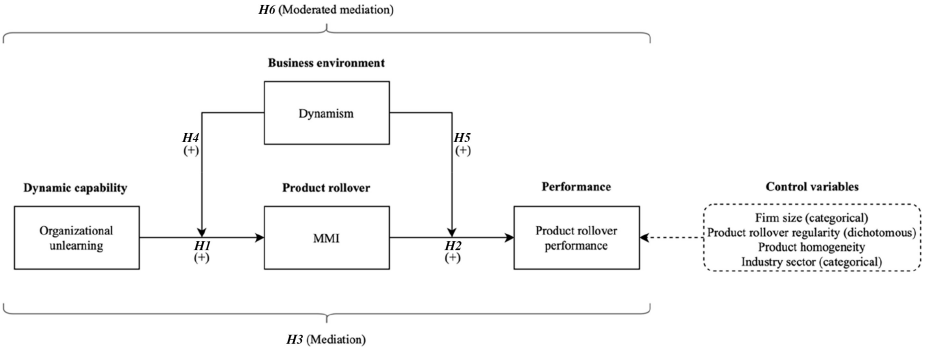

Figure 1. Conceptual model
Source: Authors' own work

prudent and demand-based fillings require that any new variant differs from existing ones in a dimension that frames a product category, the manufacturer must manage the marketing mix (Sinapuelas *et al.*, 2015). With a new variant, the manufacturer aims to satisfy existing customers' unaddressed preferences or target a new segment of customers. In the McVitie's analogy, the addition of a new white chocolate-coated biscuit or of a new, less caloric biscuit offers complementary tastes to current buyers of existing chocolate-coated biscuits or targets the new segment of health-conscious consumers, respectively. Therefore, while the manufacturer has the best interests in claiming that there is now a new variant in the assortment, it is far from any interest to convey the message that this new variant makes existing variants inferior or obsolete. As such, marketing mix considerations certainly matter in line fillings by helping the prudent manufacturer introduce a new variant that differs from existing variants. But it differs only in slot-filler (e.g. a biscuit with a new chocolate coating) or new attribute terms (e.g. a low-calorie biscuit) (Desai and Keller, 2002).

In rollovers, marketing mix considerations matter differently. When product category evolution depends on rollovers, the manufacturer must periodically replace the existing with a new generation. But now the objective is no longer to claim that there is a new variant, which the current users of existing variants can try interchangeably, or the current non-users of existing variants can start consuming. It is to convey the message that because the new generation renders the existing one inferior and obsolete, the current users (non-users) of the existing generation have a good reason to repurchase (adopt) the new generation. Therefore, when planning the transition, the manufacturer must manage the marketing mix in a more complex and thoughtful way. Is this the case in every rollover? Clearly not. Adopting a hubris-driven rollover pattern that leverages brand name and strength to create market anticipation (Bornemann *et al.*, 2020), some rollover managers insist on introducing new product generations, which are "new" only in title. Indeed, the theory of planned obsolescence similarly criticizes that, owing to certain privileges, manufacturers often engage in convenient rollovers and force them on customers (Bulow, 1986; Waldman, 1993, 1996). But even in its conservative axioms and macro-level abstractions, this theory posits that in a market structure that "*is not driven by the exploitation*" of monopoly power, positive internalities to manufacturers depend on introducing a new product generation that accounts for customers' forward-looking demand behavior and offers improvements that justify the obsolescence of the previous generation (Grout and Park, 2005, p. 607). In marketing terminology, product rollover performance in the contemporary market structure for most manufacturers should be a function of rollover teams' ability to configure the marketing mix in a way that the transition brings substantial improvement to it.

Note here some meta-analytic conclusions that, in NPD other than rollovers, a breakthrough marketing mix was not a significant driver of new variant performance (Evanschitzky *et al.*, 2012; Henard and Szymanski, 2001). However, drawing on (a) criticisms to some manufacturers for institutionalizing façade rollovers, (b) a list of known (or lesser-known) successful rollovers that were rewarded by the market, (c) the different way in which marketing mix considerations should matter in rollovers and (d) the theory of planned obsolescence, we hypothesize a direct association between MMI and rollover performance. The undisputed difference in the role of the marketing mix between line fillings and rollovers is more than implicit in the thoughts of Dhebar (1994, p. 100): "*Many durable products–especially "high-tech" products such as computer hardware and software, telecommunications equipment, and consumer-electronics items–appear to evolve faster than soaps, shampoos, and breakfast cereals*". This reflects the fact that in rollovers, the new generation must be "*even smaller, lighter, faster, fancier, and more feature-laden*". Formally, the following hypothesis is proposed:

H2. MMI is positively associated with product rollover performance.

Based on theory and logic, an interrelation likely exists between unlearning and MMI. If the organization maintains rigid practices and does not allow novel approaches in its *modus operandi* (Nystrom and Starbuck, 1984; Sharma and Lenka, 2022), rollover managers cannot refresh their mindset. As such, the marketing mix of a product's new model cannot benefit from new perspectives or innovative approaches. But the organization merely adopting unlearning practices does not guarantee higher rollover performance unless managers integrate new insights into the marketing mix. The theory of dynamic capabilities states that the micro-foundational resources that engender a sustainable competitive advantage can create value only when organizational members are committed to channeling their transformative potential into decision-level problems (Eisenhardt and Martin, 2000; Teece *et al.*, 1997). Therefore, as a dynamic capability, the beneficial effect of organizational unlearning on product rollover performance should be channeled through the catalytic willingness and ability of rollover teams to introduce fresh perspectives into marketing mix decisions, during the transition from the existing to the new generation of a product. Formally, the following hypothesis is proposed:

H3. MMI mediates the positive association between organizational unlearning and product rollover performance.

We now consider the moderating influence of environmental dynamism, which reflects the amount and unpredictability of change in customer tastes, preferences, product and quality standards, production technology and product features in a firm's industry (Achrol and Stern, 1988; Miller and Friesen, 1983; Sarin and Mahajan, 2001). Evidently, among other environmental dimensions, dynamism is more relevant to rollovers.

The dynamic capabilities perspective posits that a set of micro-foundational resources can drive wealth creation. Owing to their transformative potential, dynamic capabilities are generally understood to emerge primarily in firms operating within increasingly demanding environments (e.g. Teece *et al.*, 1997). However, drawing on criticisms of the original theory for its ill-defined boundaries (e.g. Arend and Bromiley, 2009), scholars found that dynamic capabilities can also be present in firms operating in stable environments, albeit alongside other types of capabilities that are less concerned with change (e.g. generic or operational). Thus, dynamic and other capability types may coexist in a firm, but the former become more important in highly dynamic environments, while the latter may suffice in less dynamic environments (e.g. Drnevich and Kriauciunas, 2011; Schilke, 2014). Applying this contingency background to rollovers, it is recognized that firms practicing such product transitions operate in industries that differ in the amount and unpredictability of change in customer preferences, product features, etc. Therefore, as a dynamic capability, the beneficial role of unlearning for MMI is expected to be amplified among firms in a highly dynamic environment. Under such conditions, unlearning enables a wholesale discarding of ossified routines and ensures that rollovers occur "*with new sets of decision options*" (Drnevich and Kriauciunas, 2011, p. 260). But for firms in less dynamic industries, the contribution of unlearning to MMI may be weaker because firms may depend more on other resources, including the learned rollover knowledge that can be retrieved from the firm's memory and that can still be useful for the transition of a product to its next generation. A broad interpretation of pertinent literature provides additional theoretical anchoring for the contingent role of unlearning; under environmental predictability, unlearning becomes less

necessary because learned knowledge can still be relevant (e.g. Sharma and Lenka, 2022). Formally, the following hypothesis is proposed:

H4. Environmental dynamism positively moderates the positive association between organizational unlearning and MMI.

Planned obsolescence theorists suggested that in a market structure with competitive elements (even though it may not be perfectly competitive), positive internalities are greatest for those manufacturers that embark on an excessive R&D program, which makes the new model of a product sufficiently superior and advanced (Grout and Park, 2005). Organizational research identifies exploitation and exploration as two decision qualities. Exploitative decisions are made on existing knowledge, are less resource-consuming, but also less breakthrough. Explorative decisions are made on a deliberate departure from existing knowledge, are usually novel but also more resource-consuming (Laureiro-Martínez *et al.*, 2015; March, 1991; Miner *et al.*, 2001). Given this tradeoff, researchers investigated boundary conditions for the effect of exploitative vs. explorative decision-making on organizational performance. Specifically, a study by Wang and Li (2008) found that, in a dynamic environment, exploitative (let alone over-exploitative) decisions can be detrimental, but that explorative (and more so over-explorative) decisions can be beneficial. However, in the absence of industry demand for change, organizational performance depends more on the exploitative qualities of decisions and less on their explorative (or over-explorative) components. Bringing this contingency picture to rollovers, we posit that the beneficial effect of an improved marketing mix on rollover performance should be greatest in highly dynamic environments. The frequent and unpredictable change in customer preferences, product features, etc. should make rollover performance a stronger function of explorative marketing mix decisions, even if the proportion of exploration is excessive. But in less dynamic environments, an over-explorative marketing mix is less likely to enhance rollover performance any further than a marketing mix with higher proportions of exploitation. A broad interpretation of planned obsolescence perspectives provides additional justification; even though a notable new model superiority is the essence of rollovers, "*stable product markets provide reliable, intuitive bases for moderating product improvement rates*" (Dhebar, 1994, p. 118). Formally, the following hypothesis is proposed:

H5. Environmental dynamism positively moderates the positive association between MMI and product rollover performance.

The background of *H4* and *H5* suggests an overarching moderating influence of environmental dynamism (Dhebar, 1994; Drnevich and Kriauciunas, 2011; Teece *et al.*, 1997; Tsang and Zahra, 2008; Wang and Li, 2008). In the presence of industry demand for change, the deployment of a firm-level transformative capability that enables the abandonment of obsolete routines (i.e. unlearning) becomes essential for rollover performance but must be leveraged exploratively in the marketing mix. In less dynamic industries, the above conjecture may become less necessary. Rollover performance may now (a) depend on generic or operational resources that are channeled exploitatively in the marketing mix (hence in a resource-saving way) and (b) become less likely to improve any further by the deployment of transformative micro-foundational ammunition and its explorative (hence resource-consuming) channeling in the marketing mix. Formally, the following hypothesis is proposed:

H6. Environmental dynamism moderates the mediating effect of MMI in the association between organizational unlearning and product rollover performance.

Methods

Sample and data

We collected data through an online survey in the UK. Drawing on the theory of planned obsolescence (Waldman, 2003) and on sectoral suitability for rollover inquiry (Dhebar, 1994), we targeted sectors in which product evolution depends on generational successions. Based on the Global Industry Classification Standard, we developed a cross-sectoral frame of UK-based manufacturers of durable goods. Focal sectors were industrial goods (electrical equipment; machinery), consumer discretionary (automobiles and components; durables), health care (equipment; biotechnology) and information technology (hardware; software).

We administered the survey through Qualtrics and Prolific Academic and applied four screening/eligibility criteria. First, we checked the firm's sectoral eligibility. Second, we aimed for marketing/NPD managers because pilot testing indicated that they possess the necessary knowledge for informed rollover responses. Third, following broader guidelines (Homburg *et al.*, 2012), we targeted informants who were as senior as possible and reported both full-time employment status and sufficiently long tenures with their firm. Fourth, we provided potential respondents with a detailed definition of a product rollover, asked them to report whether their firm had fully implemented a rollover within the last five years from the survey and, if yes, to choose and briefly describe a specific rollover case and use it as the base for the survey.

Of the 1,056 (Qualtrics) and 192 (Prolific Academic) potential participants, we collected 145 and 51 eligible responses, respectively. From a gross total of 196, we discarded 17 responses due to survey straight-lining and speeding. We were left with a net total of 179 responses. Of our informants, 61.50% were senior and 38.50% middle-level, with a mean tenure of over nine years. Between-panel Mann–Whitney U-tests on our model constructs showed non-significant differences across means. Therefore, enlisting two different data sources in one sample was not a concern.

Measures

The survey instrument was a structured questionnaire. We measured organizational unlearning with the reflective six-item construct of Lyu *et al.* (2020), capturing a firm's ability and readiness to abandon obsolete knowledge and routines (1: strongly disagree, 7: strongly agree). To measure MMI, we used the reflective marketing mix standardization scale developed by Katsikeas *et al.* (2006) and adapted it to our context in two respects. First, we dropped items that were not relevant to marketing mix decisions in the context of product rollovers. Second, following calls by Diamantopoulos and Winklhofer (2001) for a formative specification of certain marketing constructs (e.g. inter-item causality, absence of item interchangeability), we treated this variable as a first- and a second-order formative measure. The adapted construct included sixteen formatively specified items, capturing the extent to which the marketing mix of the new product generation became worse/better in comparison to the old generation during the rollover (1: much worse, 7: much better). While this scale allows for bidirectional assessment, we use the term "improvement" in MMI to reflect the theoretically relevant positive pole. The adopted response format ensured conceptual and methodological consistency regarding MMI. Equally importantly, it allowed for superior diagnosticity compared to rival response formats (e.g. *low*-to-*high* change in the marketing mix), given that the essence of a rollover is improvement and not mere change (Dhebar,

1994; Grout and Park, 2005). For product rollover performance, we used the reflective new product performance operationalization of Langerak *et al.* (2004). We adapted the anchors of the original construct to a rollover context, such that each item captured the extent to which the performance of the new generation of a product (i.e. accounting, sales, financial) was worse/better than the performance of the old generation, one calendar year after rollover completion (1: much worse, 7: much better). This time horizon is consistent with recommendations that performance outcomes should be assessed over a different temporal period relative to that of predictor independent variables (Katsikeas *et al.*, 2016). For environmental dynamism, we used a four-item operationalization (e.g. Sarin and Mahajan, 2001), reflecting the rate of change in customer preferences, product standards, product technology, etc. (1: strongly disagree, 7: strongly agree). We controlled for the effects of firm size (as reflected by the number of full-time employees, using a three-level categorical operationalization), product rollover regularity (a proxy for rollover experience, indicating dichotomously whether a focal product's successive rollover intervals were evenly spread) (Bornemann *et al.*, 2020), product homogeneity (a firm's technical, functional and benefit-related product similarity to competitors) (Homburg *et al.*, 2010) and industry sector. For clarity and online flow, we pretested the instrument among scholars and managers from our focal sectors (Hulland *et al.*, 2018).

Common method variance

Because we relied on one informant per firm, we addressed common method variance *a priori* and *post hoc* (Hulland *et al.*, 2018). Specifically, we granted confidentiality, phrased items concisely, varied construct anchoring and checked informants' rollover knowledge adequacy (mean = 3.97 on a five-point self-reported rollover knowledgeability item). Also, we measured MMI formatively (rather than reflectively), which is less likely to cause common method bias (Bag *et al.*, 2021). Regarding *post hoc* controls (e.g. Chin *et al.*, 2013; Kock, 2015), a full multicollinearity test on all aggregate variables revealed that all inner variance inflation factor (VIF) values were below 1.58 (< 3.30 threshold). Also, the inclusion of informants' tenure (an unrelated construct) as a marker variable in our measurement model had minor effects on the β parameters and no effect on the level of significance of the paths. The above *ex-ante* steps and *ex-post* controls ensured that common method variance was not pervasive in our survey.

Endogeneity

As our empirical implementation tests causal explanations statistically, endogeneity is a concern (Hair *et al.*, 2019). Following recommendations by Hult *et al.* (2018), we used the Gaussian copula approach, which assumes that the endogenous variables are non-normally distributed. Using the composite scores from the path model estimation, we carried out the Kolmogorov–Smirnov test with Lilliefors correction for unlearning and MMI. The results indicated that these constructs exhibited non-normally distributed scores, permitting the use of the Gaussian copula. Treating MMI as the dependent variable, the copula for unlearning was non-significant [$p > 0.05$; 95% bootstrapping confidence intervals (CIs) including zero]. This suggests that endogeneity is not an issue for the relationship between unlearning and MMI. We also tested the copulas for unlearning and MMI on rollover performance. While the copula for unlearning was non-significant ($p > 0.05$; 95% bootstrapping CIs including zero), the copula for MMI was significant. Therefore, we used control variables to alleviate endogeneity (Hult *et al.*, 2018). We included firm- (firm size), rollover- (rollover regularity) and industry-specific (product homogeneity; industry sector) control variables that may influence rollover performance. This inclusion did not affect the results.

As a further robustness check, we utilized the instrumental variable approach through a two-stage least squares regression analysis using STATA. We identified two suitable instrumental variables in our dataset, namely, decentralization (Theodosiou *et al.*, 2012) and top management risk aversion (Jaworski and Kohli, 1993) and calculated the first-stage *F*-statistics, which indicated an *F*-value higher than the threshold of 10 ($F = 14.70$). The two instrumental variables were found to be exogenous (Sargan test: $\chi^2 = 0.09$, $p = 0.770$; Bassman test: $\chi^2 = 0.08$, $p = 0.778$). We also used the Durbin–Wu–Hausman tests (Durbin $\chi^2 = 2.85$, $p = 0.092$; Wu-Hausman *F*-statistic = 2.70, $p = 0.102$). The above non-significant results suggest that endogeneity did not threaten our findings.

Analysis and results

Measurement model assessment

We used the Smart PLS v.4.0.8 software to estimate and validate our model. We applied partial least squares structural equation modeling (PLS-SEM) because (a) the very specific nature of rollovers did not allow us to collect a very large sample and (b) our model includes a formative measure (Hair *et al.*, 2019). To run statistical analyses with a higher-order construct, we specified MMI using the disjoint two-stage approach (Sarstedt *et al.*, 2019). We assessed the loadings, internal consistency and composite reliability of the reflective measures for unlearning, rollover performance and environmental dynamism, all of which had satisfactory values (Table 1). Regarding convergent validity, average variance extracted (AVE) values for all constructs exceeded the 0.50 cutoff. For discriminant validity, we applied the Fornell–Larcker criterion, which confirmed that the square root of the AVE exceeded each construct's correlation with other constructs (Table 2). We also assessed the heterotrait–monotrait (HTMT) ratio, which should be less than 0.85. All HTMT comparisons were lower than the conservative level of 0.85 (Table 3), while the upper bounds of the bias-corrected and accelerated CIs (BCa CIs) did not include the value of 1, indicating that the study's constructs were empirically distinct. Next, we assessed the formative measure for MMI. Unlike reflective constructs, formative ones should not correlate. Therefore, multicollinearity is a consideration in formative measure assessment. The VIF values for all indicators of the formative lower- and higher-order components of MMI were well below the cutoff value of 5 and close to (or lower than) the conservative threshold of 3.3 (Table 4) [2]. We also assessed the significance of the outer weights for the indicators of the lower- and higher-order components. While most indicators reached significance, a few did not. However, following standard practice (Hair *et al.*, 2021), we retained the non-significant indicators as they exhibited outer loadings greater than 0.50.

Structural model assessment

First, to assess the in-sample predictive power of the endogenous constructs of MMI and rollover performance, we observed their R^2 values, which were 0.32 and 0.50, respectively. In view of our structural model's parsimony and the number of predictors for each of the above two constructs (fewer predictors for MMI, more predictors for rollover performance), we can consider the above R^2 values satisfactory (Hair *et al.*, 2021). Second, to assess the predictive relevance of the model, we observed the Q^2 values for MMI and rollover performance. These values were, respectively, 0.26 and 0.04 and suggestive of out-of-sample predictive power (> 0 threshold) (Hair *et al.*, 2021). Third, we estimated the structural model with 10,000 replications. Table 5 summarizes the results. Our control variables did not affect the parameters and statistical significance of the hypothesized associations.

Table 1. Reflective measurement model results

Reflective constructs and items	Loadings
Organizational unlearning (Cronbach α = 0.86; CR = 0.89; AVE = 0.58)	
Our company…	
Is ready to acquire new technologies and knowledge from various channels	0.65
Seeks to adopt new knowledge, even when it is in conflict with well-accepted experience and knowledge	0.77
Provides favorable context for changing obsolete beliefs	0.80
Is ready to change the way it operates	0.75
Can establish new product processes based on real needs	0.81
Is ready to abandon routines of the past if they no longer serve a purpose	0.80
Product rollover performance (Cronbach α = 0.85; CR = 0.89; AVE = 0.58)	
Met revenue goals	0.79
Met sales growth goals	0.80
Met market share goals	0.76
Met return on investment	0.74
Met profitability goals	0.77
Met development costs	0.70
Environmental dynamism (Cronbach α = 0.82; CR = 0.88; AVE = 0.65)	
In our kind of business…	
Marketing strategies change very frequently	0.78
Product standards change very frequently	0.79
Customer preferences in product features change very frequently	0.85
Technology employed changes very frequently	0.80
Product homogeneity (control) (Cronbach α = 0.77; CR = 0.85; AVE = 0.66)	
In our industry, it is difficult for us to differentiate ourselves from competitors based on technical product characteristics	0.68
With regard to functionality, our products are not very different from our competitor's products	0.93
Our products and our competitor's products have the same benefits for customers	0.81

Source(s): Authors' own work

Hypotheses testing

Regarding main effects, in line with *H1*, organizational unlearning is positively associated with MMI ($\beta = 0.43$, $p < 0.001$). In line with *H2*, MMI is positively associated with rollover performance ($\beta = 0.62$, $p < 0.001$).

Regarding the mediating role of MMI in the unlearning-to-rollover performance association, the results show a significant indirect effect ($\beta = 0.26$, $p < 0.001$), with a 95% CI that excludes zero. In view of the non-significant direct effect of unlearning on rollover performance ($\beta = 0.12$, $p > 0.05$), the significant indirect effect is suggestive of an indirect-only mediation (Zhao *et al.*, 2010). Therefore, *H3* is supported.

With *H4* and *H5*, we posit a moderating effect of environmental dynamism on the unlearning-to-MMI and MMI-to-rollover performance associations, respectively. In support of *H4*, we observe a positive and significant synergy between dynamism and unlearning in the prediction of MMI ($\beta = 0.14$, $p < 0.05$). Simple slope analysis demonstrates a flatter slope at low (−1 SD) and a steeper slope at high levels of the moderator (+1 SD) (Figure 2). However, we do not observe support for *H5*; the interactive effect of dynamism and MMI on

Table 2. Correlations and Fornell–Larcker criterion for validity assessment

Construct	1	2	3	4	5	6	7	8	9	10	11	12
1. Organizational unlearning	*0.76*											
2. MMI	0.48**	–										
3. Product rollover performance	0.42**	0.67**	*0.76*									
4. Environmental dynamism	0.49**	0.44**	0.35**	*0.80*								
5. Firm size (small)	−0.01	−0.18*	−0.13	0.04	–							
6. Firm size (medium)	0.08	0.11	−0.06	0.06	−0.36**	–						
7. Product rollover regularity	−0.10	−0.03	−0.04	−0.29**	0.08	−0.19*	–					
8. Product homogeneity	0.08	0.14	0.13	0.27*	−0.15	0.06	−0.13	*0.81*				
9. Industrial goods	−0.12	−0.17*	−0.10	−0.13	−0.01	0.02	0.05	−0.31	–			
10. Consumer discretionary	0.02	0.03	0.04	0.05	0.01	−0.05	0.01	0.14	−0.21**	–		
11. Health care	−0.03	−0.03	−0.02	−0.10	−0.01	−0.05	0.07	−0.05	−0.19*	−0.19*	–	
12. Information technology	0.02	−0.01	−0.04	0.09	−0.05	−0.06	−0.04	−0.03	−0.30**	−0.31**	−0.28**	–

Note(s): The diagonal elements (*in italics*) are the square roots of the AVE values. * $p < 0.05$; ** $p < 0.01$
Source(s): Authors' own work

Table 3. HTMT criterion for validity assessment

Construct	1	2	3	4	5	6	7	8	9	10	11
1. Organizational unlearning											
2. Product rollover performance	0.49										
3. Environmental dynamism	0.58	0.41									
4. Firm size (small)	0.04	0.14	0.12								
5. Firm size (medium)	0.09	0.08	0.08	0.36							
6. Product rollover regularity	0.13	0.08	0.31	0.08	0.19						
7. Product homogeneity	0.13	0.15	0.37	0.16	0.09	0.19					
8. Industrial goods	0.12	0.10	0.14	0.13	0.02	0.05	0.04				
9. Consumer discretionary	0.09	0.05	0.07	0.01	0.05	0.01	0.16	0.21			
10. Health care	0.05	0.09	0.10	0.01	0.05	0.07	0.07	0.19	0.19		
11. Information technology	0.11	0.08	0.10	0.05	0.06	0.04	0.06	0.30	0.31	0.28	

Note(s): HTMT criterion assessment is not applicable to formative constructs
Source(s): Authors' own work

rollover performance is non-significant ($\beta = -0.10$, $p > 0.05$). Figure 3 shows the corresponding simple slope analysis.

With *H6*, we predict an overarching moderating role of environmental dynamism in the indirect association between unlearning and rollover performance. Full support for this hypothesis requires a significant indirect index, which embeds two conditional paths of the moderator: environmental dynamism × X → M and environmental dynamism × M → Y. However, as *H5* is not supported (i.e. environmental dynamism × M → Y is non-significant), we specified only one overarching indirect path for the moderating effect of dynamism on the association between unlearning and MMI. The results show a significant moderated mediation index ($\beta = 0.09$, $p < 0.05$), with a 95% CI excluding zero. Additional analysis indicates that the mediation pathway gets stronger from low (−1 SD: $\beta = 0.17$, 95% CI: 0.056–0.313) to high levels of environmental dynamism (+1 SD: $\beta = 0.30$, 95% CI: 0.170–0.476). Jointly interpreting the above, we can claim partial support for *H6*.

Discussion

In testing *H1*, we found support for a dynamic capability-reasoned positive association between unlearning and MMI (e.g. Teece *et al.*, 1997). Given that the essence of a rollover in a competitive market structure is a substantially superior new product generation (Grout and Park, 2005), our finding suggests that the micro-foundational resource of unlearning allows rollover managers space (and gives them authority) to act in a mindset, which capitalizes on existing and still relevant knowhow, ensures continuity in product identity and history, but breaks free from existing rollover predicaments that may bound the new product generation to a façade.

In testing *H2*, we found support for a planned obsolescence-premised positive association between MMI and product rollover performance. This finding contributes to bringing into perspective the way in which the marketing mix must matter in rollovers. Through the normative description of the basic problem facing a durable goods manufacturer who sells output in each of two different periods, the theory of planned obsolescence guided our conceptualization in two respects. First, by formalizing the inferiority and obsolescence of the first period's output as a necessary condition for equilibrium, this theory specified the essence of what was later termed *a product rollover* and implied its fundamental difference from product line filling (Bulow, 1986; Swan, 1972; Waldman, 1993, 1996). Second, even in

Table 4. Formative measurement model results for lower- and higher-order components

Lower-order components (formative) and items	Outer loading	VIF
Compared to the old generation of the product, how would you evaluate the new generation of the product in terms of the following?		
Product improvement		
Product quality	0.70	1.68
Product design and style	0.54	1.73
Product features	0.77	1.56
Brand name	0.79	1.17
Price improvement		
List price	0.76	1.62
Credit terms and conditions	0.84	1.67
Discounts and allowances policy	0.68	1.52
Profit margins	0.80	1.54
Distribution improvement		
Length of distribution channels	0.79	1.73
Intensity of distribution	0.84	2.07
Control over distribution channels	0.81	2.06
Inventory management	0.82	1.65
Promotion improvement		
Communication campaign/ support	0.78	1.74
Support from public relations	0.79	2.48
Communication budget	0.83	1.83
Advertising message	0.85	1.89
Higher-order components (formative)		
MMI		
Product improvement	0.86	2.06
Price improvement	0.92	2.95
Distribution improvement	0.89	3.38
Promotion improvement	0.84	2.87

Source(s): Authors' own work

Table 5. PLS-SEM results

Paths	β	*t*-value	*p* -value	BCa CIs
Organizational unlearning → MMI (*H1*)	0.43***	5.85	0.000	[0.277, 0.567]
MMI → Product rollover performance (*H2*)	0.62***	7.32	0.000	[0.443, 0.773]
Organizational unlearning → Product rollover performance	0.12	1.60	0.109	[−0.022, 0.274]
Organizational unlearning → MMI → Product rollover performance (*H3*)	0.26***	4.28	0.000	[0.156, 0.388]
Environmental dynamism → MMI	0.25**	3.35	0.001	[0.091, 0.385]
Environmental dynamism × Organizational unlearning → MMI (*H4*)	0.14*	2.34	0.019	[0.019, 0.250]
Environmental dynamism → Product rollover performance	0.02	0.21	0.832	[−0.153, 0.198]
Environmental dynamism × MMI → Product rollover performance (*H5*)	−0.10	1.51	0.132	[−0.250, 0.021]
Environmental dynamism × Organizational unlearning → MMI → Product rollover performance (*H6*)	0.09*	2.19	0.027	[0.012, 0.166]
Control variables				
Firm size (small) → Product rollover performance	−0.27	1.52	0.130	[−0.596, 0.100]
Firm size (medium) → Product rollover performance	−0.39**	3.25	0.001	[−0.637, −0.169]
Product rollover regularity → Product rollover performance	−0.10	0.88	0.382	[−0.323, 0.113]
Product homogeneity → Product rollover performance	0.02	0.21	0.834	[−0.183, 0.121]
Industrial goods → Product rollover performance	−0.02	0.13	0.894	[−0.361, 0.347]
Consumer discretionary → Product rollover performance	−0.07	0.38	0.704	[−0.412, 0.276]
Health care → Product rollover performance	−0.16	0.87	0.387	[−0.538, 0.171]
Information technology → Product rollover performance	−0.17	1.25	0.212	[−0.456, 0.087]

$R^2_{\text{MMI}} = 0.32$; $R^2_{\text{product rollover performance}} = 0.50$
$Q^2_{\text{MMI}} = 0.26$; $Q^2_{\text{product rollover performance}} = 0.04$

Note(s): *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
Source(s): Authors' own work

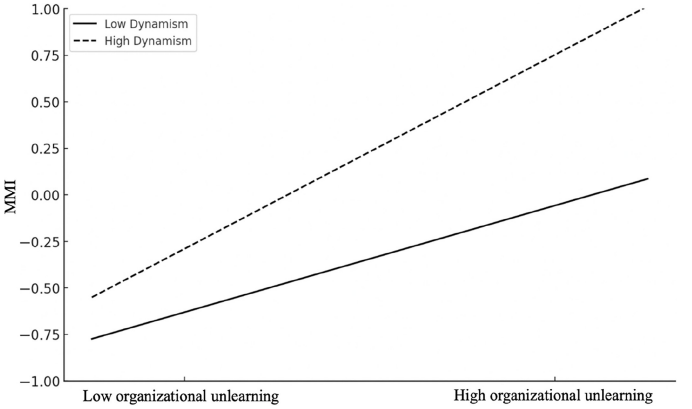

Figure 2. Simple slope analysis for *H4*
Source: Authors' own work

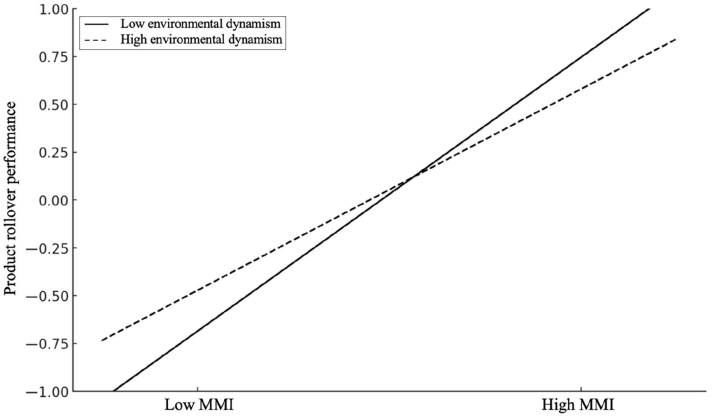

Figure 3. Simple slope analysis for *H5*
Source: Authors' own work

its higher level of abstraction, the theory of planned obsolescence postulated the superiority of demand-driven over supply-driven output transitions (implicitly trivial and convenient for the manufacturer) for the maximization of positive internalities in competitive equilibria (Grout and Park, 2005; Waldman, 2003).

Regarding *H3*, useful implications are in order from the mediating effect of MMI, especially in the absence of a significant direct effect. More broadly, this finding indicates support for the dynamic capabilities perspective that unique firm-level resources contribute to wealth creation when employees deploy them effectively at the level of problems and decisions (Eisenhardt and Martin, 2000; Teece, 2007). More specifically, it suggests that not only can MMI enhance rollover outcomes *per se*, but it can also activate firm-level strategic momentum for competitive advantage in product rollover decision-making.

In testing *H4*, we observed support for a more pronounced association between unlearning and MMI in a highly dynamic environment. This finding adds to the rollover literature new evidence about the conditions under which an unlearning-promoting climate can be most beneficial to rollover teams for improvements in the marketing mix of multigenerational products. More broadly, it extends to the rollover level previous theorizations of boundary conditions for the universality of the dynamic capabilities perspective. These theorizations suggest the coexistence of dynamic and other capability types within a firm, but recommend an environmental dynamism-specific deployment of capability type (Drnevich and Kriauciunas, 2011; Schilke, 2014).

With *H5*, we premised our prediction on environment-driven boundaries for the contribution of exploitative vs. explorative decisions on organizational performance (Wang and Li, 2008). We posited that, while in less dynamic industries rollover managers' exploitative (hence less resource-consuming) marketing mix decisions may suffice for positive rollover outcomes, in highly dynamic industries the marketing mix improvement that is necessary for better rollover performance is the distillate of an explorative rollover process. However, we failed to observe support for our prediction. This may suggest that even in highly dynamic industries, exploitative marketing mix decisions may suffice for rollover performance if a firm's existing rollover knowledge base does not depreciate quickly by the frequent improvements in product features, production technology, etc. But it may also be that even in less dynamic industries, explorative marketing mix courses of action are necessary for better rollover performance because such is the existing rollover knowledge base of the firm that it becomes vulnerable even to the less frequent changes in product features, production technology, etc. Certainly, more research is needed into this conjecture, especially in view of product-specific considerations (e.g. industry newness vs. maturity of the product concept) (Dhebar, 1994).

With *H6*, we predicted that when industry demand for change is greatest, organizational unlearning is most beneficial for rollover performance, provided that such benefits are channeled exploratively in the marketing mix. However, this conjecture may become less necessary in less dynamic industries, where an exploitatively channeled deployment of existing resources may suffice for rollover performance. We observed partial support for this overarching prediction, owing to the non-significant outcome of *H5*. The explanation for the significant overarching influence of environmental dynamism is similar to that for *H4*, while we can attribute its non-significant overarching influence to alternative explanations echoing those for *H5*.

Theoretical implications

When product category evolution depends on rollovers, manufacturers are faced with the interdependence between NPD and elimination decisions. This interdependence makes rollovers operationally more complex than product line fillings because of the extra tasks of optimizing rollover frequency, type (i.e. single vs. dual) and inventory management. Recognizing such unique operational technicalities of rollovers, scholars have contributed useful optimization perspectives (e.g. Bornemann *et al.*, 2020; Li *et al.*, 2010; Xu *et al.*, 2025). But the above interdependence also makes rollovers more complex marketing-wise. In product line fillings, a new variant complements the preferences of current users of existing variants or targets a different customer segment. But in rollovers, the manufacturer presents the new product generation and appeals to (a) current users of the old generation for upgrading and (b) current users of substitute brands for adoption. Then, intuitive logic suggests that one good reason for the market to embrace the new generation is its considerable superiority over the old generation.

The above context highlights the important role of the marketing mix for manufacturers practicing rollovers. Acknowledging the marketing-related intricacies of rollovers, researchers contributed with useful investigations into (a) how consumer characteristics and intergenerational price elasticities shape the intention to buy and probability to switch to the next generation (e.g. Danaher *et al.*, 2001; Jung *et al.*, 2022) and (b) strategies with which manufacturers can synchronize the commercialization of the new generation and the elimination of the existing generation (Saunders and Jobber, 1994). However, three relevant questions remained directly unanswered in the rollover literature before our study. First, what is the impact of organizational unlearning on MMI? Second, does MMI matter for rollover performance? Third, how does the business environment influence the positive impact of organizational unlearning on MMI and, in turn, rollover performance? By addressing these questions, our study makes a three-fold contribution to the product rollover literature.

First, it highlights the beneficial role of a transformative capability that allows the discarding of obsolete routines in a firm's *modus operandi* (i.e. organizational unlearning), challenging the prevailing assumption that organizational learning alone is a sufficient condition for rollover planning and coordination (Billington *et al.*, 1998).

Second, while marketing-oriented rollover studies referred to the significance of an improved marketing mix in the transition (Saunders and Jobber, 1994) and criticized previous research for ignoring this significance (Danaher *et al.*, 2001), they did not directly and empirically address the actual association between an improved marketing mix and product rollover performance. In this study, we hypothesized and found a positive association between MMI and product rollover performance. What makes this finding an important addition to the rollover literature, is that we overarched the corresponding hypothesis by the higher-level of abstraction perspective of the economic theory of planned obsolescence; manufacturers of multi-generational products are better able to enjoy positive internalities if they are committed to making the new product model sufficiently superior to the existing product model, in terms of R&D, attributes and value to the buyer (Grout and Park, 2005; Waldman, 2003).

Third, this study enriches the rollover literature with an overlooked contingency perspective. Specifically, by considering the role of environmental dynamism, our findings demonstrate boundary conditions to the effectiveness of the organizational unlearning-MMI-product rollover performance causal mechanism.

Managerial implications

Manufacturers of multigenerational products can draw useful implications from this paper. First, there are examples of durable goods that have reached their n^{th} generation. What is the missing detail that often leads stakeholders to criticize (but also manufacturers themselves to retrospectively question) an otherwise operationally efficient rollover? Probably, it is the lack of a better marketing mix. Manufacturers of multigenerational products must weld the development of the new and the withdrawal of the existing product generation. Moreover, they must convince themselves and stakeholders that the new generation is superior. In this direction, operational efficiency is necessary but may not be sufficient. Driven by their genuine concern that product evolution and longevity depend on rollovers (or sticking to a prodigality driven urge to present the market with another new generation of their product), manufacturers may be forgetting (intentionally or unintentionally) the importance of MMI. In view of our finding that an improved marketing mix is a potent predictor of product rollover performance, they have a good reason to pursue it. This does not imply that every rollover requires a radical departure from the previous generation, but rather that the improvement in the marketing mix should be such that the new product generation is considerably better and not a façade.

Second, given rollover recurrence, manufacturers follow (and depend on) paths unavoidably and reasonably. As Teece and colleagues (1997) put it, path dependency reflects the journey of a firm and recognizes that "*history matters*" (p. 522); but "*a firm's previous investments and its repertoire of routines constrain its future behavior*" (p. 523). Therefore, in their ventures for successful rollovers and (through them) for better performance outcomes, manufacturers can benefit by creating an ambience that allows their rollover teams to unlearn. By this, they do not endorse a complete departure from the repertoire of rollover routines. They encourage rollover teams to advance a product to its next generation by leveraging the useful and still relevant elements of the repertoire, while discarding entrenched patterns that may have worked in the past but are unlikely to add marketing mix substance to the next generation of a product. Such an organizational climate can be the fertile ground for rollover team members to unleash the explorative talent that is necessary for substantively improved rollovers. The absence of such a climate may drive rollover team members to resist change and remain at rest, with adverse implications for the marketing mix and for product rollover performance, especially in dynamic industries.

Limitations and future research

Our study is subject to limitations, which concurrently suggest avenues for future inquiry. Knowledge flow, new knowledge creation and organizational unlearning may be impeded among aging firms (Thongpapanl *et al.*, 2018; Tsang and Zahra, 2008). Here we focused on the outcomes of unlearning at the rollover level and not generally on its barriers or facilitators. If age is negatively related to unlearning universally, then in our dataset, higher (lower) ratings in this construct could possibly reflect younger (older) organizations. But this is only a speculation. Therefore, although the omission of firm age is unlikely to have affected our theorization, we acknowledge it as a limitation [3].

Methodologically, the use of the same scale anchors for both the measures of MMI and product rollover performance (i.e. much worse/much better) may raise some concerns. While we (a) gave a different time orientation to the outcome measure (relative to the MMI measure) and (b) statistically established discriminant validity between the two measures, we acknowledge a potential limitation and encourage future research to use different scale formats or operationalizations. For example, MMI could be measured on a scale with "no improvement/substantial improvement" as anchors or captured as a percentage of improvement from the old to the new generation of a product. Also, it would be useful to objectively measure product rollover performance.

For parsimony, we considered only one driver of MMI and only one moderating environmental dimension. Although we believe that this conceptual frugality does not seriously undermine our intended contributions, we acknowledge it as a limitation and highlight it as a signifier of promising further research. Product-wise, we did not consider some potentially useful details, like product importance to the firm and generation number. The willingness of rollover teams to engage in notable (hence laborious) improvements in the elements of the marketing mix may be influenced by a multigenerational product's contribution to corporate sales volume and profitability and significance for the image and history of the firm. Likewise, it would be interesting to relate the indirect unlearning-to-rollover performance association with whether a product is young (hence rollover teams cannot but act *ad hoc*) or has already progressed through some generations (hence rollover teams may be inertially inclined to a routinized rollover). Planned obsolescence theory-wise, we did not address the secondhand market assumption, whereby a manufacturer may decide to move a product to its next generation in a way that controls for the valuation of the previous generation among secondhand demanders (Bulow, 1982). Therefore, it would be

useful to address whether MMI *per se* and its interrelations with unlearning and rollover performance are affected by whether secondhand market considerations are primary for a manufacturer of durable goods [4]. Dynamic capability theory-wise, we did not consider the role of other capability types (e.g. generic, operational) and of capability heterogeneity (Drnevich and Kriauciunas, 2011; Schilke, 2014). Future research could investigate the possible interplay between unlearning and learning for the prediction of MMI and rollover performance across different levels of environmental dynamism. We remind here that we plausibly attributed the attenuated positive effect of unlearning on MMI in less dynamic environments to manufacturers' greater reliance on existing rollover knowledge. Likewise, addressing the contribution of capability heterogeneity (i.e. the extent to which a firm's dynamic and other capability types differ from those of rivals), future studies can enrich the rollover literature with useful evidence about the role of different capability types (and of their complementarities) in shaping MMI and (through it) rollover performance, across different levels of environmental dynamism. External environment-wise, future work adopting similar conceptualizations to ours can address the moderating roles of regulatory dynamism, competitive intensity and environmental complexity.

We conclude with an additional set of suggestions for future inquiry. Our dataset originates from the non-transitional economy of the UK. If organizational unlearning is strongly associated with MMI in an institutional environment where firms must usually discard fewer routines, how more beneficial could it be for manufacturers practicing rollovers in transitional economies, where a larger-scale unlearning may be necessary (Sharma and Lenka, 2022; Tsang and Zahra, 2008)? Therefore, testing similar conceptualizations in transitional economies can be useful.

Our conceptualization may differ not only between firms but also within. For example, could it be that the monumental acclaim for the second generation of the PlayStation console (Ng, 2023; Wikipedia, 2024) was the result of the manufacturer's stronger endorsement of an unlearning-friendly climate and rollover teams' greater motivation to channel new perspectives in the marketing mix of this item, compared to its previous and next generations? Researchers could identify firms with a product that has progressed through some generations, treat it as the unit of analysis and adopt a within-firm/between-generation theorization of capability type and heterogeneity, MMI and rollover performance.

Finally, regardless of their orientation (i.e. operations vs. marketing), all the extant contributions to the rollover literature modelled or empirically implemented their approach on physical goods. Indeed, as originally formalized by the forefather theory of planned obsolescence, a rollover concerns (by definition) durable goods. However, because a generational succession may also be relevant to some providers of intangible products, it would be academically and managerially interesting if scholars attempted service-specific conceptualizations of rollovers, especially in view of the service-dominant logic (Vargo and Lusch, 2017).

Notes

[1.] See the paper of Sharma and Lenka (2022) for a detailed presentation of the concepts and contexts of organizational unlearning, as well as for a taxonomy of research on its antecedents and outcomes.

[2.] In view of potential collinearity (and following the suggestion of an anonymous reviewer), we tested the robustness of our results by removing the higher-order component of distribution improvement from the MMI construct. This removal had only a minor impact on parameter sizes and did not disturb the level of statistical significance of the hypothesized associations.

[3.] The authors thank an anonymous reviewer for bringing to the fore the relevance of firm age in conceptualizations involving organizational unlearning.

[4.] The authors thank an anonymous reviewer for bringing this interesting possibility to the fore.

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Corresponding author
Nikolaos Kyriakopoulos can be contacted at: n.kyriakopoulos@tudelft.nl