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THOUGHT LEADERSHIP BRIEF

When to Spread Technological Bets: A Longitudinal Study of the Global Flat Panel Display Industry

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KEY POINTS

- Corporate groups can be an effective organizational structure for firms to balance both flexibility and commitment during technological changes. By establishing subsidiaries that each concentrate on a particular technology, corporate groups can take advantage of pursuing multiple alternative technologies while maintaining the advantages of technological commitment.
- Corporate groups pursuing a flexibility strategy benefit more from external collaboration. However, without proper internal coordination, a subsidiary's external collaboration can have an adverse impact on other members of the corporate group.
- The success of a flexibility strategy is contingent on the resolution of uncertainty. The advantages of the flexibility strategy in terms of innovation are more pronounced among late entrants who encounter increasing socio-economic uncertainty.

ISSUE

The technology substitution process results in fierce competition among competitors with regard to innovation, timing, and market appeal. The intense format wars between Video Home System (VHS) and Betamax, as well as the battle among Firefox, Chrome, and Safari, demonstrate the difficulty of establishing market dominance. The outcome of a technology war can be unpredictable, with an initially winning technology eventually failing, while a seemingly inferior technology may end up being the ultimate winner. The uncertainty and competition have fueled debates in the popular press about what technology will be "the next big thing." Companies are also actively searching for a winning formula, the right technology to become and remain a market leader.

To tackle this challenge, managers can adopt two strategies. The first is a flexibility strategy, where companies allocate resources across multiple competing technologies and exploit the most promising ones when uncertainty is reduced. The second strategy is a commitment strategy, where companies select and concentrate on a single emerging technology. Adopting a flexible approach helps companies develop absorptive capacity, enables them to adapt to ongoing uncertainty, and opens up opportunities for knowledge integration from other fields. However, companies may be hesitant to adopt a flexibility strategy due to the managerial costs of maintaining multiple competitive options within the company, such as investment ambiguity, redundant use of financial resources, and dispersion of managerial focus. Additionally, executives may worry about the costs associated with switching between different options. Companies pursuing multiple technological paths tend to have a lower learning rate and smaller market share in a particular technology domain, compared to companies that specialize in that technology. This disadvantage may impede the company's transition to that technology.

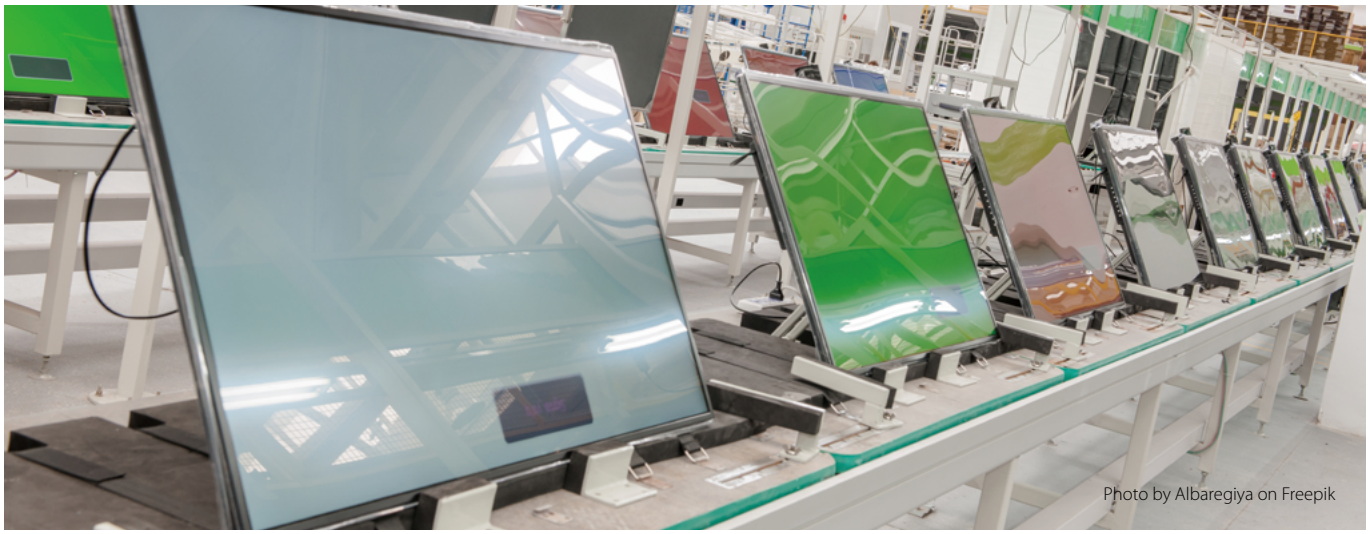
Despite this, some executives believe that by selecting an eventual winning technology and focusing their resources on becoming the first mover, they will benefit from dominance in the winning technology. However, the fall of Sharp Corporation serves as an example that this logic may not always hold true. Sharp correctly selected liquid crystal displays (LCDs) as the winning technology for flat panel displays (FPDs) and pioneered the technology, but was eventually acquired by Foxconn in 2016. In this study, we emphasize the benefits of a dual investment strategy and highlight three factors that may determine its effectiveness by examining the Sharp's experience and the history of the FPD industry. Our findings provide valuable insights for other cases across different industries.

OUR RESEARCH

With the support of the Institute for Emerging Market Studies (IEMS), we conducted a quantitative study that analyzed all patents related to flat panel displays (FPDs) from 1970 to 2010. The FPD industry is highly technology-intensive and characterized by competition between two alternative technologies, liquid crystal display (LCD) and plasma display panel (PDP). The data was obtained from Clarivate's Derwent Innovation Index, which is a widely used database in previous research.

WHEN TO SPREAD TECHNOLOGICAL BETS?

Investment decisions are inherently uncertain, and this risk is compounded by the unpredictable trajectory of technology substitution. Despite a technology appearing to have established dominance, its position can still be threatened as the emerging market evolves in an unforeseen direction. A technology that initially dominated the market may ultimately fail, while a technology that appeared to be inferior may eventually become the winner. To mitigate the risk of path dependency, where a suboptimal solution persists due to its historical legacy, it is important for firms to adopt a flexibility strategy by maintaining a portfolio of alternative technologies. However, executing a flexibility strategy presents a significant challenge for firms due to limited resources and a complex external environment. The challenge lies in effectively coordinating multiple technological options and determining the conditions that will maximize the benefits of this strategy.



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Factor 1: Organizational Structure.

A flexibility strategy can be more effective for firms with a dominant corporate group structure, which is particularly common in emerging markets. Unlike previous research, which suggests that centralized structures limit innovation, a corporate group structure can coordinate competing technologies through a division of labor within the group. Each subsidiary focuses on a specific technology while the headquarters oversees overarching strategies. This allows the headquarters to allocate resources and manage the nonlinear technology substitution process by assigning different technologies to different subsidiaries. Furthermore, headquarters can develop routines and processes to facilitate inter-unit knowledge sharing and competition. This helps the corporate group achieve a balance between exploiting the dominant technology and exploring other options to respond to potential challenges from competing technologies. Our research shows that corporate groups pursuing a flexibility strategy (e.g. developing both LCD and PDP) have better innovation performance than those pursuing a commitment strategy (e.g. focusing on only LCD or PDP). On the other hand, subsidiaries with a commitment strategy perform better than those with a flexibility strategy. In conclusion, a corporate group structure with subsidiaries each focused on a unique technology can be an effective approach to implementing a flexibility strategy.

Factor 2: Collaborating Both Internally and Externally.

Despite having a portfolio of diverse technologies, corporate groups are often criticized for having excessive control over their subsidiaries, which can lead to decreased innovation capabilities. To overcome this challenge, it is important to engage in both internal and external collaboration. External partners can provide access to new knowledge and resources, while the firm needs to have the capacity to absorb this knowledge and integrate it into their innovation activities. This capacity can be acquired through a broad understanding of emerging technologies. Our findings show that corporate groups or subsidiaries pursuing a flexibility strategy benefit more from external collaboration than those following a commitment strategy.

However, a subsidiary's external collaboration may also affect other members of the corporate group. In theory, a subsidiary of a corporate group can still access external knowledge through the collaboration of other member firms within the group. Intra-group networks can facilitate knowledge sharing among members. However, our findings show that a subsidiary with a flexibility strategy is more likely to suffer from indirect ties with other members of the group than a subsidiary with a commitment strategy, particularly if they lack direct collaboration with other members of the group. The inherent competition between technologies can lead to a lack of knowledge sharing among subsidiaries and may even hinder each other's innovation efforts. Without deliberate institutional arrangements regarding internal collaboration and competition, subsidiaries may not be able to fully benefit from indirect ties within the corporate group.

Factor 3: Entry Timing into a Market.

The flexibility strategy proves more effective for companies entering a market later rather than earlier. During the early stages of market development, a high level of uncertainty regarding the dominant technology leads to a "legitimacy vacuum," where the form and function of the new technology are not yet established. The competition at this stage mainly revolves around the potential for alternative technologies to replace the dominant one. However, as the legitimacy vacuum disappears and market demand increases, late entrants can benefit from the lessons learned by early entrants and reduce the costs of exploration. Additionally, competition between different technological ecosystems becomes more intense as technological bottlenecks are overcome. This results in a more complex and uncertain market, where unexpected outcomes, such as winning with an inferior technology, may occur. Late entrants with a wider range of initial technology choices are better equipped to respond to unexpected technological developments during market transformation.

RECOMMENDATION / IMPLICATION

The optimal business strategy between maintaining flexibility or commitment has been a subject of debate for a long time. Scholars typically examine the fit between the selected strategy and organizational structure, but they often overlook the heterogeneity within an organization's structure in executing each strategy. Our research shows that by looking at subsidiaries specializing in different technologies and coordinating those subsidiaries at a higher level, the benefits of both strategies can be obtained.

For managers to maintain flexibility in uncertain technological environments, they can consider establishing subunits through greenfield investments or acquisitions, each pursuing a particular technological trajectory. This approach has implications for the debate on whether corporate groups enhance or hinder innovation, as it highlights the importance of a structural perspective in examining innovation efforts and the division of attention at the corporate group and subsidiary levels.

Managers must also consider the external technological environment and entry timing when implementing a flexibility strategy. In situations where uncertainties persist and old technologies can re-emerge, maintaining flexibility can still be valuable, even if a technology appears to have a dominant position. Our findings indicate that early entrants benefit from staying focused and securing early market shares, while late entrants benefit from maintaining breadth and responding to emerging customer preferences.

Finally, managers should carefully consider both the organizational structure and the external technological environment when determining the best strategy to pursue. They should also keep in mind that the benefits and unintended negative consequences of external collaboration for innovation depend on the type of technology pursuit of the corporate group and its subsidiaries.

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