



Whirlpool Corporation

**EMBEDDING SYSTEMS ENGINEERING REDUCED COMPLEXITY AND COSTS,
FURTHER SOLIDIFYING THE APPLIANCE MANUFACTURER
AS A GLOBAL ENGINEERING ORGANIZATION**





Founded in 1911, Whirlpool Corporation is now one of the world's major manufacturers of home appliances centered on kitchen and laundry products.

Through the 1980s, 1990s, and 2000s, Whirlpool Corp. grew via two strategies: creating more types of products and reaching out globally for new markets to sell them. Much of that strategy was underpinned by product or company acquisitions in regional markets. However, this growth strategy created too many product architectures and overlapping products. Whirlpool Corp., a global company with roots in small communities, needed to find more efficient ways to collaborate.

Seven years ago, Whirlpool Corp. made a strategic decision to actively consolidate designs across the 150 commercial segments in which the company operates. These segments include all major home appliances, small appliances, commercial appliances, and others. The company has slashed complexity dramatically among them. Laying out systems engineering principles has vastly simplified planning, design, and manufacturing on a global basis.



“We needed to transform the company to remain competitive,” says Roberto Campos, Whirlpool Corp. executive vice president, Global Product Organization. He recalls that in 2016, the company had many issues and delays, despite the fact that its internal KPIs were fantastic. “We saw there were a lot of opportunities internally to do a better job of meeting our customers’ needs. A deep dive of product inventories confirmed that this was a systemic issue across the business: only with well-defined systems and architectures could Whirlpool Corp. achieve its goal of creating truly global platforms.

Instead of perpetuating an organization where products were created to meet the needs of just one region, Campos reframed Whirlpool Corp. as a modern, global engineering organization.

“Until 2016, we had an organization that was spread out around the globe, but none of it was global in philosophy or nature or method or approach. It was individual teams working in their own locations with each one reinventing their own versions of the wheel,” adds Ludo Beauflis, vice president, Global Platforms. “Instead, we have focused on building a true global organization, where it doesn't matter where you sit, you're building knowledge that is designed to be applied globally.”

Today, the same basic product can be produced in one to three general formats across the globe. For example, where previously there were 20 different architectures used for vertical axis washers alone. Today, all of the same end markets are served by just 3 underlying architectures.

“How to become global is not just about globalization but to enjoy scale in using the same



components across the board to create a product system with different engineers around the globe working together to implement it with minor variations around the world,” says Campos. “Today we’re proud to say that we have a truly global organization, much more organized by platforms, architectures, systems, subsystems, and interfaces, and having clearly identified modules, parts and components.”

REDUCING COMPLEXITY SHORTENS PRODUCT DEVELOPMENT CYCLES

Part of Whirlpool Corp’s strategy relied on system engineering to drive complexity reduction. “What we’ve achieved so far is about 10-20% but over time this systems engineering approach will reduce our product development cycles significantly,” says Ken Kleinhample, who as vice president of Product Development Excellence is charged with reducing product complexity.

When the initiative began, Whirlpool Corp. noticed there was relatively little on go-to-market in their KPIs, and there were no internal complexity measures.

How does Whirlpool Corp. foresee achieving its complexity reduction goals? By focusing on architectures and parts that can be reused. In the past four years, Whirlpool Corp. has reduced its product architectures globally by about 40 percent and in the last two years, reduced its parts complexity from well over 110,000 active parts to slightly more than 70,000 active parts.

“Part of our strategy in reducing complexity is that it helps us offer new products faster to our customers because we have dramatically reduced the number of parts we’re using to redesign,” adds Kleinhample.

He believes that can be achieved by late differentiation – starting with fewer building blocks that can be modified later in the design process. In the past, every time the company launched a new product a brand-new assembly line was installed.

“We are able to launch a feature in the market in a much faster way because we are starting with architectures with common interfaces, and the team focuses on the development of that feature that could be then easily integrated into the product,” adds Fernando Senger, director, Architecture Management. “Systems engineering has been enabling us to be faster to the market with innovative products.”



This strategy required substantial investment, and consumed a significant amount of executive attention. Whirlpool Corp. found that the initial phases of development of new architectures took much longer, given that teams were optimizing for a global set of products rather than only regional products. “We had to accept that some projects were going to take as long as they were going to take,” said Beaufils, adding that the intent of giving the teams more



space and time to design was largely to raise quality levels given the global distribution to follow.

EMPOWERING PRODUCT TEAMS

A key feature of Whirlpool Corp’s system engineering success isn’t just in its engineering metrics. It’s also in the way it has transformed its product teams.

“We didn’t just add systems engineering as another team or process,” says Beaufils. Instead, the company reorganized product teams into horizontal and vertical functions.

The vertical teams are Whirlpool Corp’s platform teams with key individuals leading refrigeration, laundry, and cooking groups. The intent is that they have end-to-end accountability for all products across the globe. “It means you own the system that delivers great products,” Beaufils says. These teams are ultimately the architects of product solutions and execution.

Whirlpool’s horizontal teams are more like service organizations for the platforms. Examples include consumer design, electrical subsystems, and verification and validation. “We established these to create a high level of centralization to increase competencies across the platforms in a big way,” says Beaufils, adding that these teams help drive consistency across the way vertical teams operate. “It helps bring functional knowledge of software and hardware across all of the product categories.”

To add additional core skills and competencies in systems engineering, Whirlpool Corp. also established a pathway of training for its teams from basic content to advanced. MIT’s certificate program, **Architecture and Systems Engineering: Models and Methods to Manage Complex Systems**, has been part of this transformation effort. To date, about 480 Whirlpool team members have completed this 6-month certificate course.

CAREER PROGRESSION ALONG A SYSTEMS ENGINEERING PATH

To add additional core skills and competencies in systems engineering, in 2022 Whirlpool established a systems engineering technology board.

“We needed better synergy among all the platforms for a systems engineering approach because there was nothing that really connected all of us to work in the same way, share best practices, and solve problems together process-wise,” explains Marvin Mealman, refrigeration system architect, who leads the Systems Engineering Technology Board.

The board’s main goal is elevating competence in systems engineering. “Even though some people and positions understand it, we realized we need everybody to have a minimum base of knowledge,”



Mealman adds. To that end, the board creates additional training materials and mentoring programs so that systems engineering is embedded day-to-day, from the top down within the organization.

SYSTEMS ENGINEERING LED TO IMPROVEMENTS IN INNOVATION, QUALITY, AND COST

As important as reducing complexity has been, it's not the end game for Whirlpool Corp's systems design focus. The products need to not only meet the current expectations of their customers, but also anticipate new features.

Whirlpool Corp's recent successes have been widely recognized. Within the last year, the Wall Street Journal published the Top Management 250 of America's Best-Run Companies, with Whirlpool jumping from the 39th position to 5th in one year. Innovation is one of the five key measurements of the ranking; Whirlpool earned an innovation score of 96.5 out of 100.

"To achieve the global engineering environment we envisioned back in 2016, we had to embed systems engineering into our processes, not just add it on as an additional process," says Campos. "It has supported us well in this journey."

CASE STUDY : DISHWASHING

Among the first groups to complete the MIT systems engineering certificate program were two leaders from Whirlpool's dishwasher platform in 2018.



"We knew systems engineering was becoming a requirement through all of the product platforms," says Mclvor, director, Global Architecture, Dishwashing Platform, who was charged with moving from a network of regional dishwashing product development centers into one global platform. She recalls the main mission: how to take regional dishwasher designs and create a global architecture that could be designed and manufactured anywhere.

Mclvor credits her MIT experience as a great way to get an understanding of industry best practices in terms of systems engineering. Key members of all of Whirlpool's platforms attended. "It was a part of establishing common language and processes," Mclvor recalls, "and we decided to use it internally as a way to formalize each platform's architectures."

Systems engineering thinking was evident in the team's meetings, particularly regarding architecture decisions. "It helps guide our thinking from the beginning where we made key fundamental

architectural decisions once and never went back to them,” adds Pawel Puzanowski, systems architect, Dishwashing Platform. “We can still produce variants as needed with modular components later on.”

The dishwashing architecture team also learned to differentiate between customer needs and engineering technical requirements. “Before adopting systems thinking, we often would start with a technical requirement and not with what a stakeholder needs,” adds Mclvor. “Now, that’s very much part of our vernacular we use every day.”

System engineering principles now drive dishwashing architectures from the earliest decision – when multimillion dollar decisions and capital investments are made – all the way down to maintenance of existing architectures out in the field.

After completion of the MIT course and implementation of systems engineering practices over the past few years, the dishwashing platform has made significant changes. “First, we did some natural cleanup, essentially phasing out architectures where we could easily consolidate them,” Mclvor explains. The team’s second act is deploying now. From three legacy dishwashing architectures, the team aims to scale down to just one that can be manufactured in multiple locations, and then sold in multiple locations.

Their plan is working. In the past year, Mclvor’s team retired one legacy architecture and they have a plan for another one in the next couple of years. After the first retirement, sales models were reduced by approximately 50%, global part reuse increased double-digits, key drivers of industrial manufacturing complexity were reduced by orders of magnitude, and quality improved.



Today, Whirlpool brands are proudly at the top of 5-star performance in the North American market featuring the largest third rack available - rethinking what is possible inside a dishwasher.

“Having been on this journey for multiple years, we are seeing product leadership out in the market,” says Mclvor. Starting with what consumers really want and letting that drive the design process instead of engineering to a technical decision has been transformative. “It is worth the investment when we listen to our consumers and don’t get so trapped in a finite solution,” she adds. “We are proof that the systems engineering methodology really does work and it provides predictability and speed in project execution.”

“Dishwashers became the pace car for the overall transformation of Whirlpool,” says Campos, who used the results to motivate the necessary investment and organizational changes in other divisions at Whirlpool.