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Insights from NASA

Any strategic agility or strategic change programme will involve a myriad of initiatives. We often judge the success or otherwise of such programmes based on how these initiatives pan out. This is understandable and useful, but still insufficient to give us a full picture of the longer-term trajectory and competitiveness of an organization. In placing our full attention on these numerous initiatives, we may lose track of what really matters. Namely, the adoption of a strategic time frame, the deeper business logic through which the organization operates and how that is developing, and the underlying capabilities that need to evolve over time to support the strategy and business logic. This type of thinking is the domain of the strategist rather than that of the manager or bean counter.

When NASA was formed in 1958, there was little commercial space industry to speak of. It was a game of nations, at the time primarily of the US and the Soviet Union. By 2018, the industry size grew to around $350 billion, over three quarters of which are commercial products, services and infrastructure. Projections place industry size to over $1 trillion by the 2040s. These developments are not unexpected. The commercialization of space has been a long-standing policy of the federal government that has instituted corresponding legislation such as the Commercial Space Launch Act (1984), which stated that "…the development of commercial launch vehicles and associated services would enable the United States to retain its competitive position internationally, thereby contributing to the national interest and economic well-being … the United States should encourage private sector launches and associated services."

The development of re-usable launch vehicles (such as those developed by Space-X and Blue Origin), nano-satellites (weighing 10kg or less), and more efficient propulsion systems, all fuel the growth of commercial space. The availability of expanded sources of financing is enabling new entrants to compete in this sector. Small satellites for example are creating more cost effective options for companies offering broadband, remote imaging and communication services, and in time consumer services that are priced at a level that can feed mass-market growth.

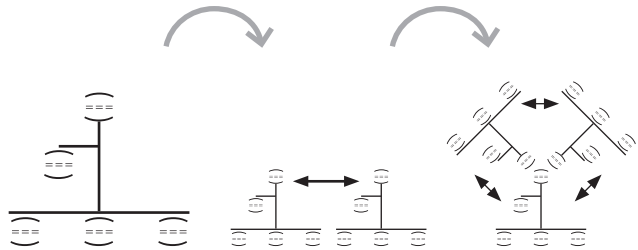
In this context, NASA has evolved from a traditional hierarchical model in the 1960s to an outward-facing commercial network model at present. In so doing, it exemplifies what we call "strategic agility"; the ability of an organization to adapt its business logic and corresponding capabilities over time so as to sustain and strengthen its competitiveness.

We can conceive of any organization's business logic and capabilities as a deeper stage on which various projects, activities, and change initiatives are acted out. In the end, what matters is to what extent this deeper stage is in sync with, suitable for, or even shaping the competitive environment, and whether it can offer sustained competitiveness to the organization concerned. The variety of initiatives, programmes and projects that an organization undertakes have to provide challenge and learning to this deeper business logic.

The evolution of business logic and capabilities at NASA

In a *Harvard Business Review* article we explored NASA's evolution since the 1960s, to show how in different phases in its history it has developed a particular business logic, and capabilities to support this logic. This evolution can be seen in terms of three phases. Firstly, a traditional, hierarchical model; secondly, a transitional, inter-governmental partnership model; and thirdly, a commercial network model. Each of these can be represented by an archetypal project: Apollo, International Space Station, and the Commercial Resupply and Crew Programs.

The Apollo programme was initiated as a response to perceived Russian superiority in space at the time, which challenged the US over long-term space leadership. Substantial budgetary and organizational resources were allocated to the programme by the government with the focused objective of accomplishing the challenge that President Kennedy posed in 1961: of getting a man on the moon and returning him safely to earth before the decade was out. The frontier technologies that NASA needed were not available commercially and necessitated the agency taking the lead in developing detailed technical and engineering specifications and closely supervising contractors to deliver them. There was thus a focus on agency-driven investments within a unitary engineering architecture to facilitate integration. The agency acted as prime contractor as well as exclusive customer on cost-plus contracts and incurred the total cost. Large systems integration capability was imported from the military to coordinate and integrate the diverse groups and inputs needed to accomplish projects of high complexity. This period was accompanied by a cultural belief in the agency's technological superiority and exceptionalism.



Business logic	Traditional, hierarchical model	Transitional model through inter-governmental partnerships	Commercial network model
Archetypal project	Apollo Program (1961-1975)	International Space Station (1993- present)	Commercial Resupply & Commercial Crew Programs (2006-present)
Organizational capabilities	Capability focus on developing and monitoring engineering specifications, contractor supervision, and large systems integration	Organizational capabilities incorporate international collaboration and inter-governmental partnerships	Focus on public-private partnerships and definition of end goals rather than detailed specs. Agency becomes catalyst for industry capability development
Cultural orientation	Culture characterized by a sense of technical superiority and exceptionalism. Agency exercises its positional authority	Cost consciousness and partnering with others take root in organization culture. Agency acts as orchestrator and influencer of a cluster of inter-government agencies	Commercial awareness and openness to industry-sourced solutions in addition to internally developed solutions. Open innovation programmes initiated
Technological orientation	Focus on agency driven investments and unitary engineering architecture. Agency acts as prime contractor in cost-plus contracts and incurs total cost	Technologically, NASA leverages international public investments, distributed responsibility, and common interfaces, standards and protocols	Agency seeds technology development by industry via milestone payments, and leverages industry investments to achieve ever more ambitious missions

Table 1: The evolution of business logic and capabilities at NASA, 1958-2018

In 1993, the agency was instructed by the White House to collaborate with other nations to design and build the International Space Station (ISS). In order to accomplish its longer-term goal of launching human deep space missions, NASA needs to learn what the effects on the human body are when in space for extended periods; and the ISS could provide that knowledge. The ISS programme fostered organizational capabilities of international collaboration and inter-governmental partnerships, where NASA acted as the orchestrator and influencer of the group. Culturally, greater cost consciousness developed as funding was progressively constrained. Technologically, NASA leveraged international public investments, distributed technical responsibility and worked on developing shared technical interfaces, standards and protocols. During this phase, NASA honed its learning of how to function in a cluster of partners rather than how to be the dominant party in a supplier-buyer relationship.

The Commercial Resupply Program was initiated in 2006 to carry cargo to the International Space Station after the space shuttle programme would be concluded. The Commercial Crew Program was then initiated in 2010 to contract out the creation and operation of spacecraft that could conduct manned missions to the ISS; to carry at least four astronauts, dock for 180 days and return them to earth. NASA contracts attached to these programmes helped to seed a growing commercial space sector, including support for Space X and Orbital Sciences that won contracts to resupply the ISS. During this phase there was a focus on public-private partnerships and specification of end goals rather than detailed engineering specifications. Through the contracts and the know-how that NASA shared with industry, it became a catalyst for industry capability development. Culturally, there was a higher commercial awareness and openness to industry-sourced solutions in addition to internally developed solutions, and open innovation programmes were initiated. Rather than being the prime contractor and the exclusive customer in cost-plus contracts, in this model the agency seeds technology development by industry via milestone payments, and leverages industry investments to achieve ever more ambitious missions. Table 1 summarizes NASA's evolution of its business logic and capabilities over time.

NASA's evolution of business logic has been taking place in the context of a structural shift in the space industry from state dominance and high barriers to entry in its early days towards commercial enterprise, lower barriers to entry, higher collaboration between state and commercial actors, and innovation in terms of its offerings. The traditional industry model was a hierarchical one,

where commercial entities have been suppliers to state agencies that conceived of, led and carried out missions. The industry has been morphing to a network model where collaboration across commercial as well as state entities is crucial and where commercial entities can launch their own missions both as partners and as competitors. Government space agencies are contracting out more aspects of low earth orbit missions and are focusing their resources on the bigger prize of deep space exploration such as NASA's planned manned mission to Mars.

Notes for the strategist

Where does all this leave the strategist? We can view NASA's evolution of business logic and capabilities as an ongoing learning process that enables sustained competitiveness in a changing competitive environment. Reaching this point is only a way station in the big picture of focusing resources on launching human missions to Mars and deep space. NASA's Global Exploration Roadmap that includes such missions, for example, is predicated on capability development over time as a result of learning from experience.

The NASA example highlights the importance of a longer-term strategic timeframe where the focus is on an organization's deeper business logic that has to be in sync, or challenge, or even shape the external competitive environment. The myriad of change projects and initiatives can be seen as ways to build organizational capabilities that operationalize an evolving business logic.

Such a focus also enables the strategist to allocate scarce resources to initiatives that have a clear connection with building particular capabilities to support an ongoing evolution in business logic. In the end, the apparent outcome of short-term initiatives matters less than whether the underlying logic and capabilities are evolving in the right direction.

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