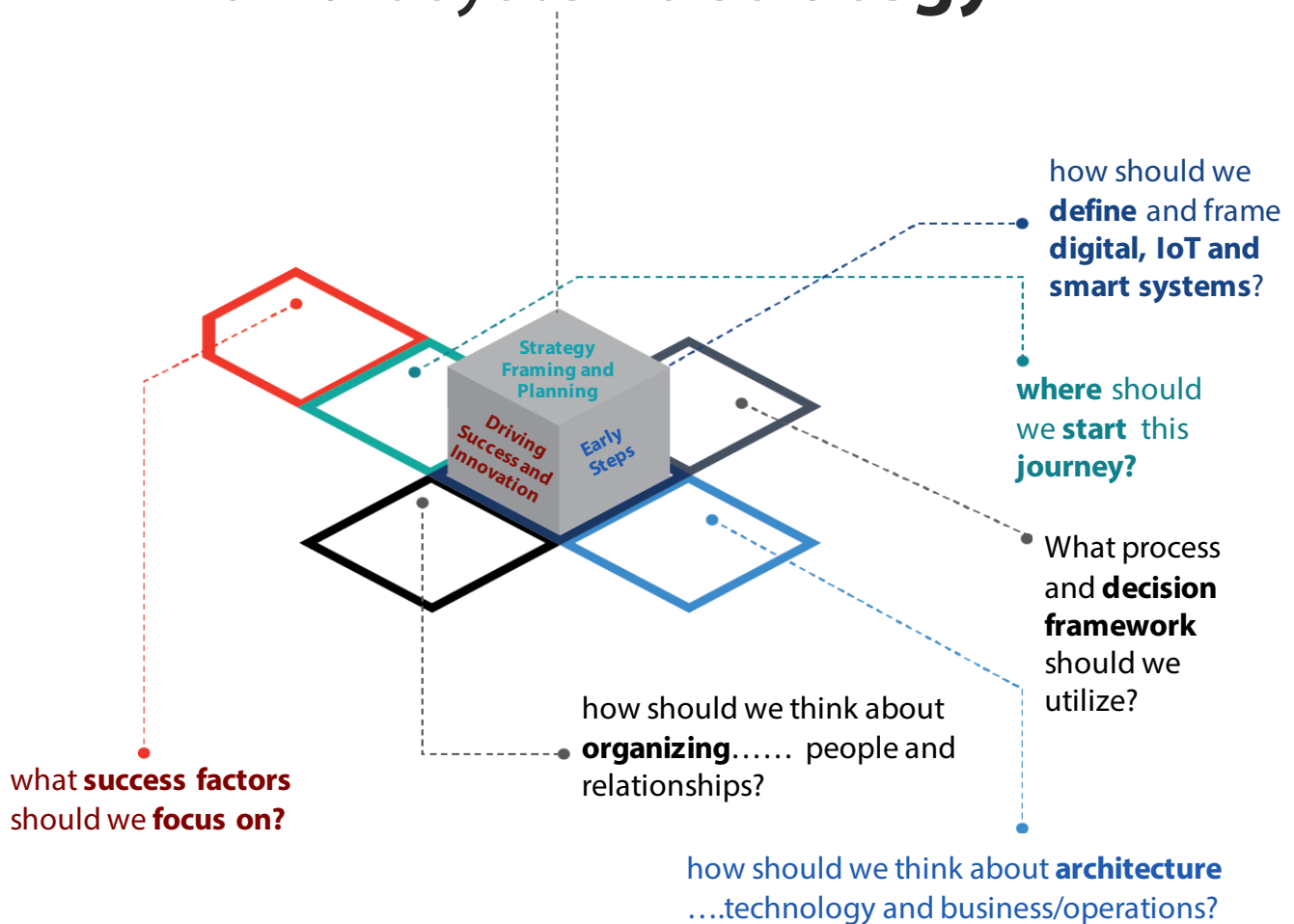# THE CHALLENGES and PITFALLS of DIGITAL TRANSFORMATION

When traditional business practices, company culture and operating models inhibit the required creativity and speed to effectively drive new customer solutions and value creation, that is when an OEM needs to seriously consider alternative innovation modes and ventures

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developing **digital** and smart systems **strategy**

Strategy Framing and Planning

Driving Success and Innovation

Early Steps

how should we **define** and frame **digital, IoT and smart systems**?

where should we **start** this **journey?**

What process and **decision framework** should we utilize?

how should we think about **architecture** ….technology and business/operations?

how should we think about **organizing**…… people and relationships?

what **success factors** should we **focus on?**

WHAT ARE SMART SYSTEMS?

A new generation of computing systems and information architecture that when combined with artificial intelligence, machine learning and Internet of Things technologies are breaking away from today's information, computing and telecom (ICT) paradigms to enable intelligent real-world physical systems to be integrated onto networks and the data from machines, sensors, video streams, maps, people, news feeds and more to become an integral part of all information systems.   This new paradigm is driving all information systems and, more importantly, their interactions towards real-time, state-based, context-sensitive capabilities that integrate people, processes, physical equipment and knowledge to enable collective awareness and better decision making.

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01: OEM GROWTH CHALLENGES

The industrial device, equipment and machinery universe encompasses a wide range of companies that develop and supply the equipment that other companies need to run their operations. The impact of original equipment manufacturers (OEMs) on the global economy cannot be understated. The breadth of equipment and products spans from components such as semiconductors and sensors to robotics and industrial machinery as well as complex test and measurement systems.

This paper identifies new forces acting on players and markets and seven key growth themes that tie closely to future OEM competitiveness which, in turn, are tied to several technology trends we believe will enable new customer solutions and new non-traditional growth opportunities. Digitization and the continued evolution of Smart Systems technologies will impact virtually every dimension of any OEM's growth strategy and operating model and will likely make the business look and feel very different in the coming years.

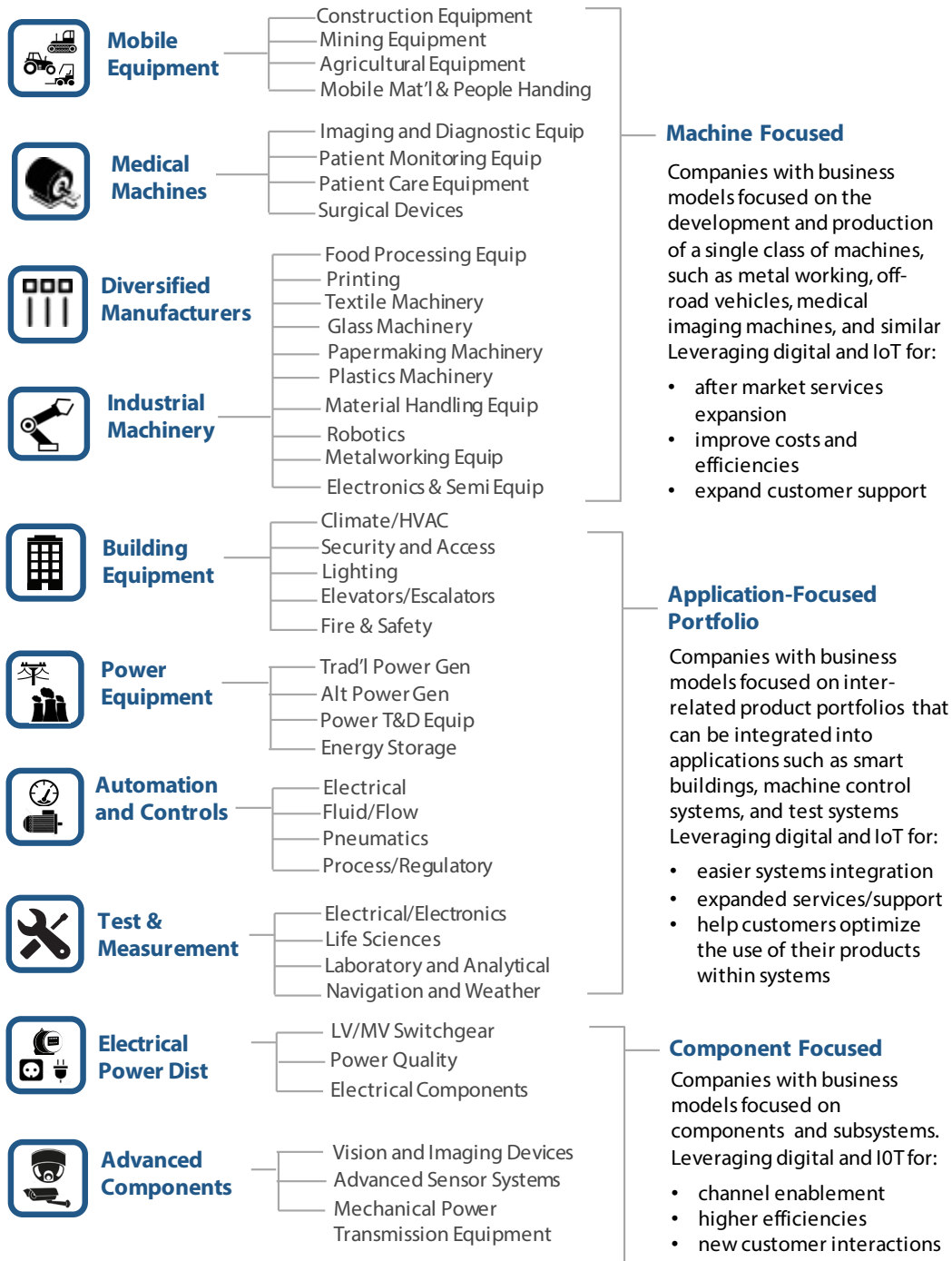### MACHINE and EQUIPMENT MANUFACTURERS FACE DRAMATIC CHANGES

While it is difficult to generalize, most OEM segments are undergoing dramatic change due to broader forces at work in the marketplace but also because of the impacts driven by digital and Internet of Things technologies. The advent of connectivity for intelligent equipment and machines is enabling asset monitoring and tracking to ensure uptime, performance, availability, software version control, and location analysis for a wide range of applications. As networks continue to invade the physical world of sensors and machines, many OEM's have come to understand the significant value created from extracting and leveraging the machine data and usage information from their equipment.

As the Industrial OEM arena evolves past the last several turbulent years, multiple forces [such as global economic expansion] are likely to contribute to positive growth in the short to moderate term. The overall health of the global economy and global gross domestic product (GDP) growth historically tie closely to the growth of machines and capital equipment. For leadership teams in OEMs, identifying and understanding key forces and trends and their potential impacts on their specific product, machine or systems segment, will be critical for sustaining growth and performance in the long run. Management in equipment manufacturers and machine builders will face tough trade-off decisions related to new technology and innovation investments as well as rapidly evolving business and operating models.

Technologies, markets, customer needs and competitors are all changing rapidly. Consider just a selection of the many forces at work in the marketplace today:

» As the economy has evolved to a more service-oriented and increasingly digital state, the importance of speed and agility as well as building new skills has increased dramatically.

Exhibit 01: OEM Business Model Characteristics

Mobile Equipment
- Construction Equipment
- Mining Equipment
- Agricultural Equipment
- Mobile Mat'l & People Handing

Medical Machines
- Imaging and Diagnostic Equip
- Patient Monitoring Equip
- Patient Care Equipment
- Surgical Devices

Diversified Manufacturers
- Food Processing Equip
- Printing
- Textile Machinery
- Glass Machinery
- Papermaking Machinery
- Plastics Machinery

Industrial Machinery
- Material Handling Equip
- Robotics
- Metalworking Equip
- Electronics & Semi Equip

Building Equipment
- Climate/HVAC
- Security and Access
- Lighting
- Elevators/Escalators
- Fire & Safety

Power Equipment
- Trad'l Power Gen
- Alt Power Gen
- Power T&D Equip
- Energy Storage

Automation and Controls
- Electrical
- Fluid/Flow
- Pneumatics
- Process/Regulatory

Test & Measurement
- Electrical/Electronics
- Life Sciences
- Laboratory and Analytical
- Navigation and Weather

Electrical Power Dist
- LV/MV Switchgear
- Power Quality
- Electrical Components

Advanced Components
- Vision and Imaging Devices
- Advanced Sensor Systems
- Mechanical Power Transmission Equipment

Machine Focused

Companies with business models focused on the development and production of a single class of machines, such as metal working, off-road vehicles, medical imaging machines, and similar Leveraging digital and IoT for:
- after market services expansion
- improve costs and efficiencies
- expand customer support

Application-Focused Portfolio

Companies with business models focused on inter-related product portfolios that can be integrated into applications such as smart buildings, machine control systems, and test systems Leveraging digital and IoT for:
- easier systems integration
- expanded services/support
- help customers optimize the use of their products within systems

Component Focused

Companies with business models focused on components and subsystems. Leveraging digital and I0T for:
- channel enablement
- higher efficiencies
- new customer interactions

5

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» Capital is increasingly available and abundant. The scale of financial assets is now roughly 8-10 times global GDP, making unique skills and new innovation concepts far more important than capital formation and also, are the true constraint on an OEM's ability to drive new growth.

» Industries are consolidating into a "winner-takes-all" mode. Virtually any product or services segment likely had twenty or more significant competitors thirty years ago. Today that number is typically 3-5 globally dominant leaders in each segment collectively earning as much as 75% or more of the profit pool.

» Wall Street demands and rewards quarterly profits and short-term performance in the name of driving shareholder value. Shorter management horizons and increased pressures from investors are what drives businesses today with less emphasis on longer term investments in new growth.

We would describe all of the above trends as "classic." What we mean is the relationship of these trends to an OEM's core product business is predictable. For OEMs to succeed in their core product businesses they will need to continue to carefully set priorities and investments to address prevailing trends in the marketplace. Innovation for the core business is, for the most part, sustaining, incremental and continuous. Performance measurement, repeatability, risk management, continuous improvement and financial discipline are the minimum requirements to help drive a continuing cycle of improved costs and higher levels of customer support.

However, we believe new digital and Smart Systems technologies will have an out sized impact on OEM's strategy and begin to turn long held beliefs upside down. For example, many managers believe that you can be big and low cost, or you can be focused and differentiated—but not both. Today's Smart Systems and IoT technologies are enabling new modes of services delivery and creating new opportunities with data and analytics capabilities that either significantly reduce, if not eliminate, this classic strategic trade-off. This, we believe, is but one example of the extraordinary effects new systems technology will have on OEMs.
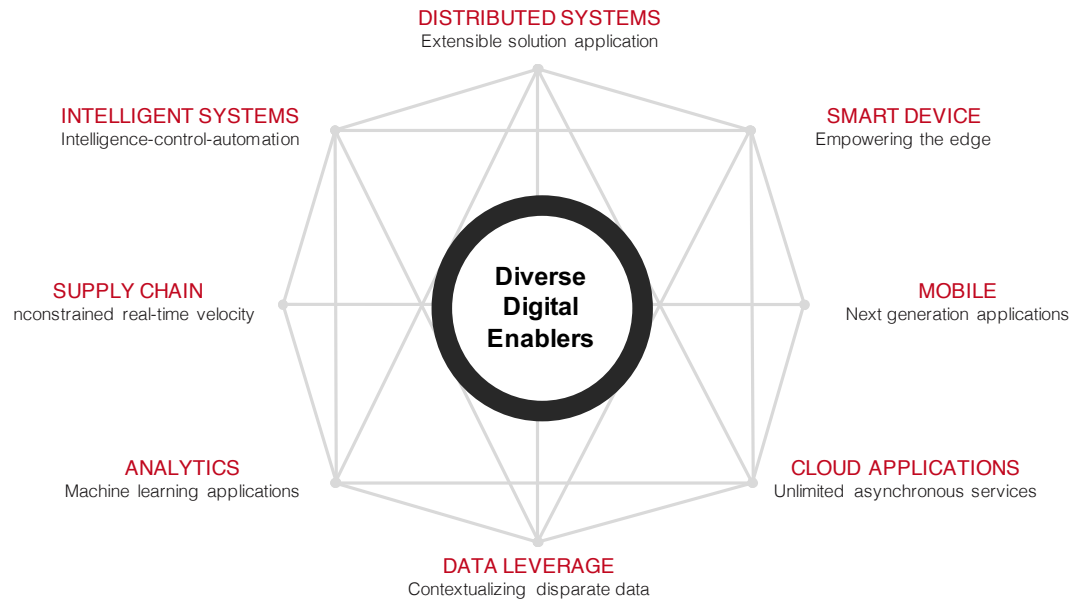
02: DIGITAL PITFALLS

Traditional management in many OEM businesses tends to assume that, whatever the OEM's focus, their business and their peer OEMs share similar characteristics, organization structures, product development protocols and sales and marketing practices. Management attention in OEM businesses has traditionally focused on the known, the visible, and the predictable. Anything too difficult to measure is too often treated as if it were unreal.

Even more misleading is the assumption that "business as usual" will prevail over a given planning period. Such assumptions leave little room for dynamic management (or creation)

of change, the early identification of emerging markets or technical discontinuities, or the increased presence of unfamiliar competitors. Traditional planning processes, with their linear view and built-in bias towards the established and predictable, will fail to prepare OEMs for the significant changes coming.

Exhibit 02: Digital Solution Enablers

DISTRIBUTED SYSTEMS
Extensible solution application

INTELLIGENT SYSTEMS
Intelligence-control-automation

SMART DEVICE
Empowering the edge

SUPPLY CHAIN
nconstrained real-time velocity

Diverse Digital Enablers

MOBILE
Next generation applications

ANALYTICS
Machine learning applications

CLOUD APPLICATIONS
Unlimited asynchronous services

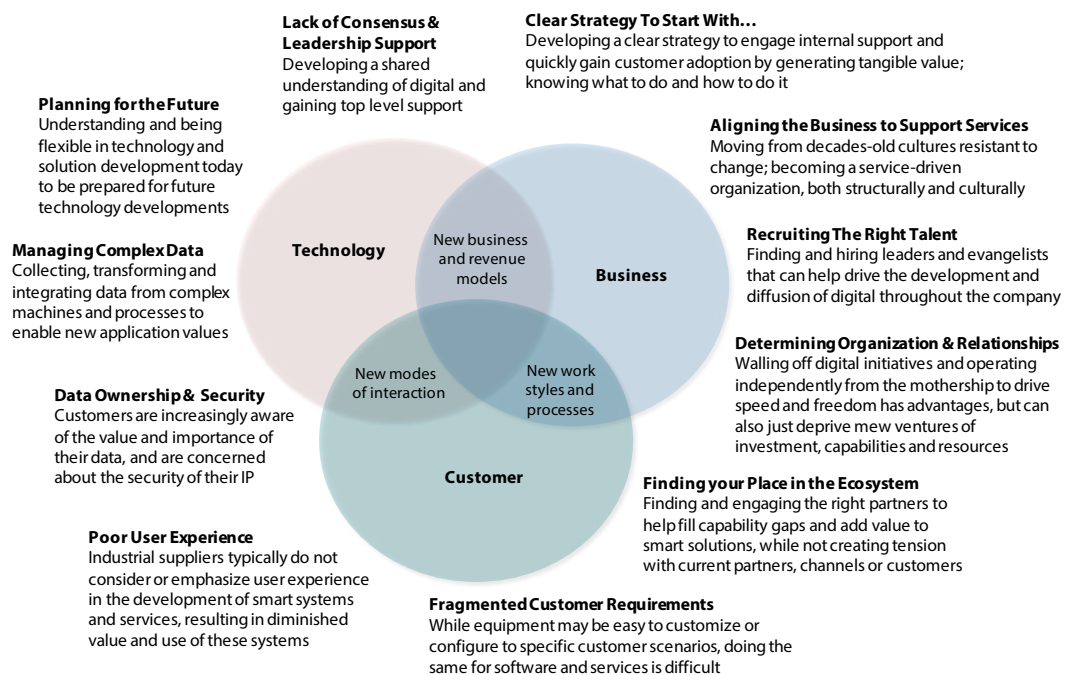DATA LEVERAGE
Contextualizing disparate data

OEMs will need to be better at spotting emergent trends and being able to quickly respond to new market entrants with new technologies or evolving competitive threats. In this fast changing environment, leadership's ability to identify emergent trends and potential discontinuities "around corners" will become a minimum requirement. In our experience this capability is more art than science and requires very acute observation of the external world. Staying close to customers, vigilantly tracking competitors maneuvers and tapping alliance and ecosystem partners for new insights and perspective are all methods to become more acutely aware of change.

Today, across diverse manufacturing business segments, many companies feel they are being disrupted by digital, smart systems and IoT technologies. Incumbents are quickly realizing that in order to address the next wave of opportunity, they will have to shift from product-driven organizations to service-driven businesses but, for the most part, are not driving tangible results. Why is that? We believe there a many diverse challenges and pitfalls, including:

» Companies not knowing where to begin on the digital and IoT journey and who in the organization should own the initiatives.

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» A lack of education or disagreement amongst leadership for what digital and IoT means as a growth opportunity for the company.

» Too many siloed digital projects happening all at once, no central function or organization schema to capture the whole opportunity.

» Leadership does not understand or has not seen examples of proven ROI or tangible measures for success, which impedes companies from getting out of the starting gate.

» Companies are taking a technology first mentality, meaning they focus on leveraging "AI" or "Blockchain" and just assume they will achieve value in the long-term.

» Peers and Suppliers aren't geared or organized to support digital and IoT in an ecosystem, or do not understand how to design or navigate dynamic partnerships in the context of an ecosystem.

Exhibit 03: Digital Challenges and Pitfalls

Lack of Consensus & Leadership Support
Developing a shared understanding of digital and gaining top level support

Clear Strategy To Start With...
Developing a clear strategy to engage internal support and quickly gain customer adoption by generating tangible value; knowing what to do and how to do it

Planning for the Future
Understanding and being flexible in technology and solution development today to be prepared for future technology developments

Aligning the Business to Support Services
Moving from decades-old cultures resistant to change; becoming a service-driven organization, both structurally and culturally

Managing Complex Data
Collecting, transforming and integrating data from complex machines and processes to enable new application values

Recruiting The Right Talent
Finding and hiring leaders and evangelists that can help drive the development and diffusion of digital throughout the company

Technology

Business

New business and revenue models

Data Ownership & Security
Customers are increasingly aware of the value and importance of their data, and are concerned about the security of their IP

New modes of interaction

New work styles and processes

Determining Organization & Relationships
Walling off digital initiatives and operating independently from the mothership to drive speed and freedom has advantages, but can also just deprive mew ventures of investment, capabilities and resources

Customer

Poor User Experience
Industrial suppliers typically do not consider or emphasize user experience in the development of smart systems and services, resulting in diminished value and use of these systems

Finding your Place in the Ecosystem
Finding and engaging the right partners to help fill capability gaps and add value to smart solutions, while not creating tension with current partners, channels or customers

Fragmented Customer Requirements
While equipment may be easy to customize or configure to specific customer scenarios, doing the same for software and services is difficult

It is still early on, but the mounting pressure and potential disruption to companies that manufacture products could be quite large. In order to achieve success, companies need to start with real customer pain points and problems and work with them to collaboratively create solutions.

In our experiences working with a diverse cross-section of manufacturers, one of the most important dimensions to making these initiatives work (a dimension, I'm frustrated to say, that is too often overlooked) is identifying the right people and mix of staff to drive strategy, engagement, and empathy; a group that can quickly develop the right energy level and enthusiasm as well as having a "stick-to-it" and "see-it-through" attitude for new smart systems and digital business creation.

While we strongly believe Smart Systems and IoT technologies will play a central role in OEM's strategies going forward, we have also observed how difficult it's been for many OEM's to integrate new digital and IoT technology into their core business. As the pace of Smart Systems and IoT technology adoption increases, many managers will be challenged by the trade-off decisions they will face. Should we invest more in the core business or invest more in new autonomous innovation teams and new growth ventures?

When traditional business practices, company culture and operating models inhibit the required creativity and speed to effectively drive new customer innovation and value creation or, when traditional operating models constrain the organization's ability to develop new technical skills or organizational capabilities, that is when an OEM needs to seriously consider alternative innovation modes and non-traditional growth ventures.
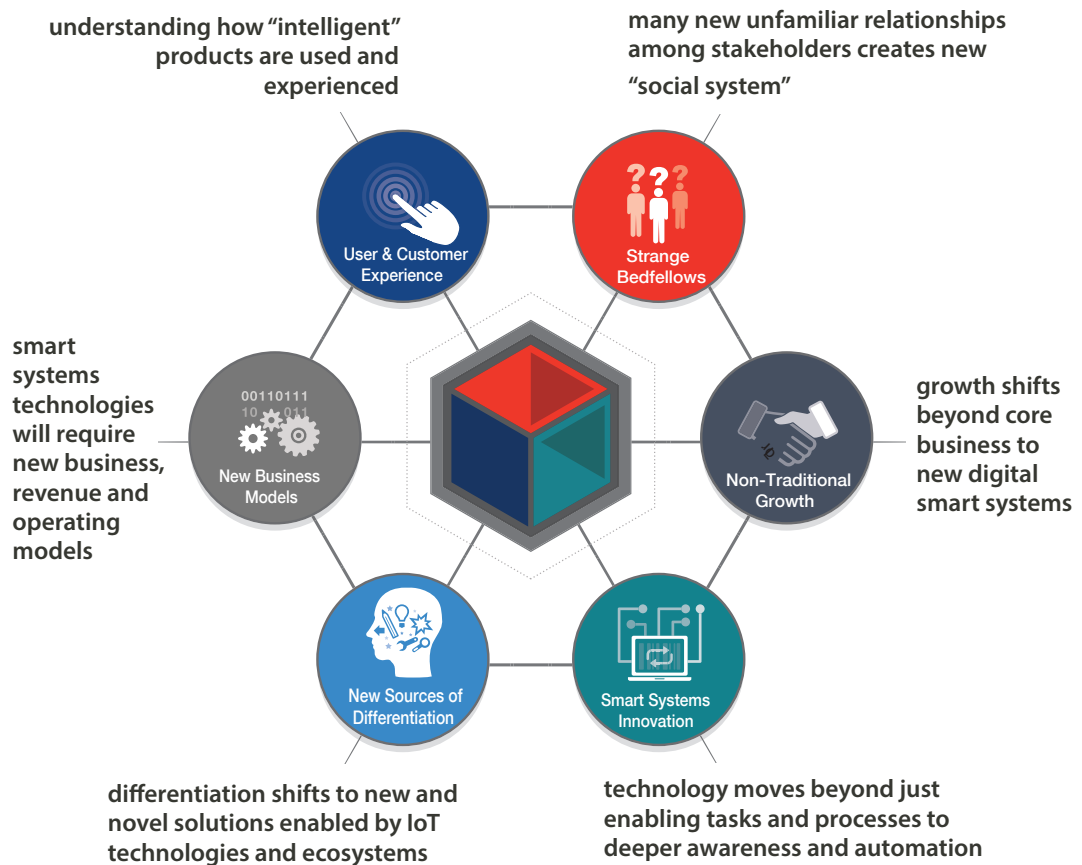
03: EVOLVING GROWTH THEMES

The business environment for OEMs has entered a new chapter with new challenges and unfamiliar technologies impacting virtually all of the diverse players and segments across the OEM arena. Because of its breadth and diversity, it's difficult to generalize how players in specific segments should think about and respond to new unpredictable forces in the market. Even though the journey forward will differ from company to company, we believe leadership teams in OEMs should be focusing on the following growth themes:

»   **New Non-Traditional Growth Opportunities:** sources of new growth are shifting away from just growing with the market or taking market share from peer players. For many OEMs, growth is rapidly shifting beyond their core business to broader product/system/ solutions offerings, integrating new embedded digital capabilities or expanding vertical integration, particularly leveraging new services and value-added customer support.

»   **Changing Sources of Competitive Differentiation:** we believe competitive differentiation will shift away from traditional sources such as product/brand position, scale and available capital, low cost manufacturing, product portfolio, channel or customer support capabilities towards a new focus aimed at areas such as IoT enabled product innovations as well as partner and ecosystem development.

»   **User and Customer Experience:** IoT and connected product technologies are enabling radically new user and customer experiences and informing equally disruptive business

models (think of Apple, Amazon, Uber, etc.). Understanding user and customer preferences, behaviors, interactions and the technologies that can inform unique user experiences can create new differentiated offerings. This will drive a shift toward understanding how 'intelligent' products are experienced and how 'networked' products foster diverse interactions between and among manufacturers, users, application developers, technology sourcing partners and channel participants in a networked context.

Exhibit 04: Evolving OEM Growth Themes

understanding how "intelligent" products are used and experienced

many new unfamiliar relationships among stakeholders creates new "social system"

smart systems technologies will require new business, revenue and operating models

growth shifts beyond core business to new digital smart systems

User & Customer Experience

Strange Bedfellows

New Business Models

Non-Traditional Growth

New Sources of Differentiation

Smart Systems Innovation

differentiation shifts to new and novel solutions enabled by IoT technologies and ecosystems

technology moves beyond just enabling tasks and processes to deeper awareness and automation

» **Smart Systems Innovation and Optimization:** new digital and IoT technologies will drive a multi-year wave of growth based on the convergence of innovations in embedded software, machine intelligence and data and information architectures integrated with more powerful sensors, actuators and client devices connected to higher performance personal, local and wide-area networks. These technologies will work together in unprecedented ways to solve more complex business problems than previous generations of automation, control and computing technologies. These new capabilities will revolve around real-time situational awareness and automated analysis of "states" and operations. As a result, technology moves beyond just proposing task solutions — such as executing a work order

or a sales order — to sensing what is happening in the world around it, analyzing that new information for risks and alternatives, and taking actions.

» **Go-To-Market and Value Delivery Networks Drive Strange Bedfellows:** As the complexity of these systems continues to increase, the number and diversity of stakeholders, users, sellers and supporters interacting with these systems will also rise in a way that creates a "social system" comprised of new unfamiliar relationships - a phenomenon we call "strange bedfellows." Leveraging new digital data value inherent in connected products and systems will require new infrastructure and enabling technologies that will, in turn, inform the formation of new and different market relationships and alliance networks comprised of complementary equipment and device OEMs as well as third party application developers and services providers. We believe that within this solution delivery social system [or ecosystem] OEMs will need to understand new value adding "roles," but also make conscious decisions about their evolving position in market delivery alliances and networks.

» **New Business Models, Skills and Organization Designs:** The technical innovation driven by digital and IoT technologies coupled with diverse and changing relationships between and among complementary players will likely lead to changes in market structure, shifts in the sources of profit and value creation and thus, new business and operating models. Identifying and designing new business models along with developing the new skills, capabilities, systems and organizational relationships they require will be critical to success.

It is this last growth theme focused on new business models that stands out for us. The influence and disruptiveness of platform companies affect much of the business world these days. Platforms can come in many types, including a de facto standard such as Cisco's network operating system or Microsoft's Windows, or Facebook's immense user base. Platform business models that creatively combine elements of dis-intermediation, shifting profit pools, new recurring services, customer transparency or other maneuvers are all disrupting existing business and operating models - and it does not stop here - just think about supply chain and freight logistics, travel, order management, customer relationship management software, consumer lending and payments, to name a few. New platform business models are popping up everywhere leading to the question, how should OEMs respond?

Perhaps the most important perspective we have come to is about the relationship between technology architectures and business models and the "role" platforms and relationships play in enabling a whole new level of differentiation. Our evolving "thesis" points to the complexity of smart connected systems and, as the number and diversity of stakeholders expands (users, sellers, supporters, benefactors, etc.), and the volume and nature of their interactions grows, the systems or "technology architecture" will become more and more tightly coupled to the "business [model] architecture" and, in turn, the so-called platform becomes the central organizing mechanism required to deliver new data and information-driven services. Platform development decisions must be aligned with the corresponding business and revenue models

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these technologies will inform. These two "architectures" must be viewed in close proximity. Technology architectures and business architectures need to be mutually supportive without inhibiting one or the other.

However, trying to coordinate and leverage the respective roles of technology architecture and business architecture often creates contention. Many of the participants in this emerging arena that we speak with are coming to see the continuously evolving relationship between these two dimensions as fertile ground for innovation. They need to be interwoven and mutually supportive. In fact, from our own direct consulting experiences, we believe success in either - technology architecture and business architecture - increasingly goes to the company that effectively utilizes the combined potential of both.

04: DIGITAL DEVELOPMENT VENTURES

Today, the subject of corporate ventures and related maneuvers does not inspire many executives, especially in the conservative cultures that often exist within machine builders and equipment manufacturers. We believe that like a pendulum swinging, corporate ventures suffered a bad reputation starting as far back as the run up to the Internet bubble burst in the 1990s. However, because the many challenges associated with embracing digital and Smart Systems technologies are now clearer and better understood, we believe the pendulum is likely swinging back. If OEM management teams will need to live in two distinct contexts - running their core business as efficiently as possible while also being able to identify new and novel product and systems innovations, then it is very likely we have entered a chapter in the marketplace where non-traditional growth ventures and vehicles will become more common.

Developing autonomous growth ventures in parallel with the core business raises challenging operating model questions. To what extent should a new growth venture re-define elements in the core business? How, when and in what manner should the new business be integrated into the core? How will leadership make critical allocation decisions around skills, people, talent and investments? All of these questions lead to a very basic question, is it better to create new growth ventures or does it make more sense to keep an eye on similar external developments and players in the market and then either invest or acquire the new growth business?

Global expansion; re-engineering; lean practices; mergers and acquisitions. For most OEMs these strategies for growth and value creation have reached the point of diminishing returns. As networks continue to integrate the physical and virtual worlds, what worked in the past to drive new growth is less likely to work now or in the future.

To stay competitive, OEMs will need to sustain momentum in their core business while developing new digital and IoT capabilities, offerings and business models. The assumption

that the primary role of an equipment manufacturer is only about sustaining their core product business no longer works. We believe OEMs need to think seriously about new more autonomous ventures and growth vehicles for smart systems innovation. OEMs need to think about new growth businesses in a manner that transcends their core products or services. OEM business strategists need to creatively imagine fully developed application solutions, ecosystems and whole marketplaces.

Exhibit 05: Corporate Venture Development Has Had A Bad Reputation

Early stage nurturing of new technology ventures is really a "no-man's" land today

Today opportunities are not well addressed by either corporate venture programs or institutional investors

The "spread bet" mode of venture capitalists and private equity firms has been increasingly trending towards more and more conservative investments

Corporations have become addicted to acquisitions and consolidation as a growth mechanism .... companies are willing to overpay for established businesses to mitigate risk but need to understand that creating sustaining means taking risks

Manufacturers Need To Completely Re-Think How To Create New Growth Ventures...

Venture Development For Smart Systems and the Internet of Things

Requires New and Different Approaches ....

1. Design and development of all system elements for new customer solution
2. Coordination of common information sources and partner protocols
3. Alliance network and/or ecosystem mapping and development
4. Development plan
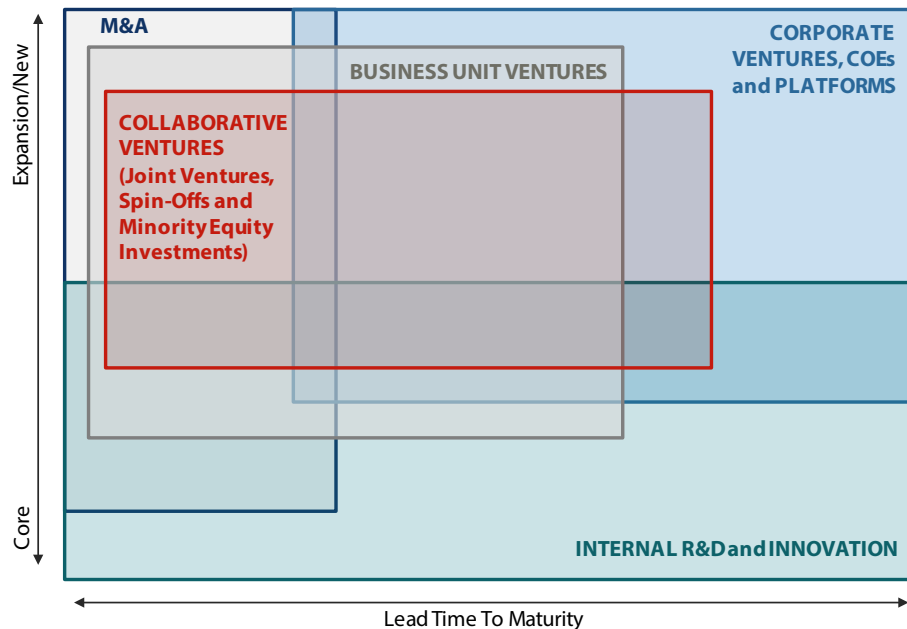5. Formulate business capitalization requirements

In our experience with clients, most OEMs are significantly challenged in their development of new growth ventures. Today, OEMs willing to act tend to select only one of many potential sources for their new ventures:

»   Internally via spin-off of sound new business ideas that surface in existing core businesses,

but where the culture and operating mode in the core do not permit them to survive beyond early R&D or development;

» Autonomous ventures often developed via a corporate venture function or similar for new high potential innovation and business concepts such as IoT platforms;

» Externally via acquisitions and minority equity investments; and,

» Externally via joint ventures created collaboratively with customer and/or partner inputs and Development.

Exhibit 06: New Growth and Innovation Modes for OEMs

MERGERS and ACQUISITIONS (M&A)
Acquisition of developed companies with existing business, innovations or assets

COLLBAORATIVE VENTURES
Joint ventures, collaborative developments, spin-offs, etc. that drive incremental revenues

BUSINESS UNIT VENTURES
Sound business idea that surfaces in core where culture or ops mode limits potential

INTERNAL R&D and INNOVATION
Internal core innovation and/ or product development

CORPORATE VENTURES, COEs & PLATFORMS
Corporate venture development groups and newer platform innovation ventures and vehicles

Accordingly, the strategies and organizational approaches adopted by many OEMs today reflect their focus on only one source of new ventures. In contrast to these more limited approaches, we believe OEMs need to move beyond their "comfort zone" and focus on synergistic market

opportunities that expand an OEM's footprint beyond their core with new growth venture development strategies that leverage a more flexible mix of these approaches – determining the best mix and the most viable "vehicle/s" for new customer solution opportunities.

OEMs need to take a more holistic view of new non-traditional growth opportunities that can include ventures that address innovations in the core business as well as collaboration with customers and partners. Exhibit 7 underscores the need for an approach that addresses differing time frames for new venture development in addition to new approaches. Some forward looking OEMs are already moving down this path. Players like GE, with the creation of its Digital unit, or Bosch's development of an autonomous platform business, are prominent examples. In both cases, these focused maneuvers became part of a larger set of developments including acquisitions, joint developments and minority equity investments.

Exhibit 07: Leading OEMs Are Driving Multi-Modal Growth Strategies

Creating Joint Sponsored Ventures	Creating New Functional Units	Creating Autonomous "Arms Length" Vehicles
Strategic alliances to drive industrial Ethernet (technology from cisco to Rockwell and market access via Rockwell channel for Cisco	Creation of GE Software to converge internal software developments to single platform – equity investment in Pivotal software to speed new platform to market	Reverse merger and acquisition to create new software business unit to drive the unique skills required in industrial software business

When multiple parallel modes of new innovation and venture development are correctly applied, OEMs can create new internal growth ventures and engage with external organizations at differing stages of development in a structured manner. Recent maneuvers by larger OEMs, as mentioned earlier, have hit a number of "speed bumps" in their development, but we believe the more important measure of progress has been management's willingness to take the risk of creating new venture businesses, developing new capabilities and forging new non-traditional relationships to create new customer solutions.

Beyond those we have highlighted, new emerging investment and venturing approaches are being organized in a variety of industries including investment vehicles that tie investors to specific ventures within a larger organization—investments that are suited to their risk profiles and that do not involve owning a share of the whole company. In healthcare, for example, several players are funding new drug developments with "focused" funding for the development of specific products, matching their capital needs with the risk preferences and domain expertise of specific investors.

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05: CATALYTIC GROWTH STRATEGIES FOR OEMs

While many companies continue to use traditional approaches to strategy development and some even succeed in this way, Harbor has seen over and over that the biggest winners are those that take firm control of their growth strategy and shape their competitive arenas. These are the companies we call "catalytic." Just as a chemical catalyst hastens the rate of a chemical reaction, companies with catalytic strategies shape their worlds at rates that take the competition's breath away.

In chemistry, a catalyst works by altering the sequence of intermediate compounds that leads to the one ultimately desired. In catalytic strategy, then, the strategist must map out the sequence of strategic steps in order to begin thinking about whether a swifter sequence can be achieved by catalytic action.

Cisco did not acquire a company during the first seven years of its existence; but, on September 24, 1993, Cisco acquired Crescendo Communications, a LAN switching company. Following the first Cisco takeover, acquisitions have constituted 50 percent of the company's business activity. Since then, Cisco has acquired close to 200 companies and dominated the computer networking arena since. What is the key to success for these companies? The short answer is that each of them has employed what Harbor Research calls "Catalytic Strategy."

In chemistry, a catalyst is an agent that speeds the chemical reaction that produces a desired compound. Similarly, in business, a catalytic strategy is one that hastens the arrival of a desired end result or state. Those results involve a "value compound," a unique combination of technological and business system elements which, when offered to customers, results in accelerated market penetration, value chain advantage, or advantageous market structure.

Of course, simply "rowing harder" may hasten the arrival of this state somewhat. But in business as in chemistry, catalysis is in essence the process of sneaking around a barrier that others are struggling to climb, and thereby arriving at the destination much more quickly. In other words, it is following an entirely new path. The catalyst itself may be the person, partner or other entity whose introduction into the business situation creates the shortcut to an advantageous structuring of one's competitive arena.

Sometimes a catalytic strategist succeeds by being the first to correctly identify clearly defined customer needs, and developing the value compounds that will attract the most desirable segments of those customers. In other situations, clearly defined customer needs cannot lead the way. In either case, the key to catalytic strategy is to create a unique business system, which puts one a leap ahead of others in shaping and attacking a market.

Flexibility, innovation, and the ability to move quickly are essential elements of catalytic strategy. But for many companies in technology driven arenas, the velocity of change in the marketplace and the number of variables in play exceed many managers' ability to make

confident and informed decisions. At too many companies, management's natural response to this environment is to try to slow the world down so they can understand and control it.

Digital "Enabler"

• Act as an "enabler" of new digital and IoT technologies and tools

• Develop new business and revenue models

• Define reference architecture and development tools

• Collaborate with BUs to drive new initiatives

• Develop and drive new skills into BUs

Digital Growth "Accelerator"

• Take more direct control of projects and initiatives in emergent arenas not well addressed by operating BUs

• Discover and develop new adjacent business opportunities to existing core businesses

• Explore M&A and investment opportunities to accelerate re-positioning and transition to new growth opportunities

• Coordinate and collaborate with diverse external organizations to drive new learning, JVs and related strategic business development

"Builder" of New Ventures

• Become central coordinator and vehicle for establishing and growing new Smart Systems growth ventures

• Promising spin-offs from BUs

• External partnerships, JVs and ventures

• External investors

Companies do this by attempting to lock in their customers, signing binding and inflexible agreements with suppliers and partners, approaching new markets with traditional means, and acquiring emerging competitors simply to remove them as market threats. These actions, while seemingly logical, in fact often run contrary to effective strategy in the evolving digital world.

Even in this modern age of Smart Systems and the IoT, where computing is now migrating towards and embedding itself into the physical world, traditional players like Rockwell Automation and Danaher are employing catalytic strategies to drive new customer value.

Rockwell Automation has been at the forefront of driving convergence of industrial automation and operational technologies with information technologies to enable connected-enterprise

strategies for its customers. Its ecosystem design includes alliances with Cisco, Microsoft and a vast network of value adding partners. Rockwell has utilized this ecosystem and disruptive technologies, such as industrial Ethernet, to help its industrial customers lay a foundation for the secure and seamless integration of the enterprise, supply chain and plant floor.

Exhibit 09: Characteristics of Digital And Smart Systems Maturity Stages

	Cooperative Digital "Enabler"	Distinctive Digital "Accelerator" Skills	Focused "Builder" of Digital Ventures
Description	Leadership enhances value of synergy between teams and/or units -- the whole is worth more than the some of its parts	Leadership creates value by developing a range of distinct digital skills, critical enablers, functions, programs, and services	Leadership enhances ability to stage and launch new digital business ventures, JVs and collaborative customer innovation
Leadership Role	Leadership fosters and encourages interactions through vision development, decision-making processes & structures, policies & guidelines, relationships, or teams/staff	Leadership provides investment and the means to drive expertise-based services and architectural enablers for BUs. The best companies align unique skills with BUs and needs	Leadership sets vision, actively supports and directly influences digital strategies and performance in BUs – could include new venture development, support for JVs and investments in infrastructure
Common Pitfalls	Synergistic efforts are often cumbersome, inappropriate, or ineffective (benefits of synergistic relationships are often overestimated)	Leadership provides resources but is not aggressive enough about setting vision, goals and criticality of initiatives	Leadership is less familiar with each business than unit leaders and can press for wrong targets, misallocate resources, or adopt inappropriate strategies

Active ← → Passive

Rockwell's broad automation and control product portfolio supported its services and engineered solutions is the company's growth engine. Rockwell's strategy is based on an open architecture that allows for the development of multi-brand networks and systems, particularly for more advanced applications. Rockwell's "Connected Enterprise" architecture integrates plant-level and enterprise networks with equipment, systems and people.

Rockwell's catalytic strategy is based on a two prong approach -- driving architectural disruption on the plant floor through strategic partnerships with Cisco, Microsoft and others while driving differentiation through its channel and ecosystem partners. The company has

built a strong channel and partner network worldwide with knowledgeable providers that help extend this architecture across industrial segments and applications. Within this context, Rockwell's recent push into software, platforms and IIoT applications has been carefully "nurtured" in BUs, their labs and through cooperative developments. The company's corporate and business development functions have been explicitly mandated to develop new strategic partnerships as well as hunt for "augmenting" acquisitions and investments.

Rockwell's leadership closely guides strategy and investments which are focused on emergent software and related digital opportunities within the industrial sector, actively evolving the company structure, pursuing multiple acquisitions and new relationships to drive cross-unit synergies and create an explicit focus on new areas of growth and innovation. For Rockwell, "catalytic" means cleverly combining technology innovation, domain expertise, with one of the best and most developed network of partners and ecosystem participants.

Between 1985 and 2010, Danaher has been one of the best-performing industrial diversified businesses based on the creative combination of it's platform/portfolio acquisition strategy and the Danaher Business System—a systematic and wide-ranging set of organizational processes the company has developed to drive growth and create value.

to stay competitive, OEMs will need to sustain momentum in their core business while developing new digital and IoT growth ventures

These successful companies have learned to actually accelerate the development of a market and use the resulting change and complexity to their advantage. Their unique and innovative business systems work to give them great advantage. Catalytic strategies don't just hasten market development, but help structure markets and competitive environments to give distinct advantages to the business innovator who moves first.

These cases are all examples of a single end of a spectrum. At this end are the strategies that follow from clearly defined customer needs, at the other are those where such needs cannot readily be seen or encompassed. What the companies at this first end of the spectrum have in common is that the ultimate value compound each company had to create was actually not difficult to envision. The customer as well as its needs were already extant and understood. It was simply a matter of building the business system that would better serve those needs, one that would render a more complete solution.

Not every OEM's situation fits this deterministic mold. At the other end of the spectrum are products that are architectural building blocks, usable in more applications than anyone can hope to imagine. These include programming languages, class libraries and reusable intellectual property, and multi-purpose electronic components such as sensor reference designs. For these products there is no simple picture of a "complete solution" that the product's creator can envision, much less control. They are at the indeterminate end of the spectrum. For OEMs like Danaher and Rockwell, the catalysts were their internal capabilities as well as new capabilities

brought into play through acquisitions. Creators of architectural innovations require different catalytic mechanisms. These players depend heavily on alliances and broad ecosystems for adoption of the new "building blocks."

ARM Holdings is the world's leading semiconductor Intellectual Property (IP) supplier withs it microprocessor design IP at the heart of over 40% of all consumer devices worldwide. ARM has an innovative business model. ARM does not manufacture the products that utilize its technology. Instead ARM creates the technology that is then used by other companies – its partners. These partners incorporate ARM IP with their own technology to create smart, energy-efficient chips suitable for modern electronic devices. The company has very cleverly nurtured the creation of a business ecosystem comprising a large network of different types of partners to develop competitive advantage in the semiconductor industry. Between 1990 and 2010, ARM became the leader in microprocessors for mobile and consumer devices; their IP lies at the core of 95% of mobile phones produced in the world based on leveraging its ecosystem and partners like Qualcomm.

new architectures, interoperability and new business protocols are minimum requirements

In 1991, former engineering professor Dr. Irwin Jacobs and his team were preparing to take the new wireless communications company Qualcomm public. They had proven that their technological approach, Code Division Multiple Access (CDMA), was feasible—and demonstrated that it could provide important benefits to wireless carriers and their subscribers. The Qualcomm team had patented a number of important advances in CMDA technology, and plans were in place for the company to design semiconductor chipsets to further advance CDMA and Qualcomm's intellectual property. On the market side, the technology had been deployed successfully in the company's OmniTRACS business, a fleet management system that was growing quickly in the market.

From these roots, Qualcomm came to understand how to create whole new markets by enabling three critical dimensions: platforms that address the needs of sub-markets with customization; portfolio including a wide variety of processing, connectivity, security, and interoperability capabilities; and partnerships to provide enablers. Qualcomm, like ARM Holdings, has built a formidable market position and created significant value.

We have only looked at two dimensions of catalytic strategy: the deterministic type that combines acquisitions mixed with customer innovation, and the non-deterministic type informed by the architectural innovators that leverage the ecosystems they develop to drive adoption. There are many potential "creative combinations" of these elements that OEMs can explore. Understanding what your company's options and alternatives will be a critical factor in your strategy development.

ABOUT HARBOR RESEARCH

An internationally recognized strategy consulting, design and technology research firm, Harbor Research has predicted, tracked, and driven the development of Smart Systems, Services and the Internet of Things since our inception in 1984. While our history is long, our strategy is simple: create value for our clients by combining creative facilitation with rigorous analysis and systems-focused thinking. It is this mindset that has given us the privilege of working with leaders in some of the greatest companies in the world. In the same way that the market has flexed and grown over the years, our services and experience have evolved to better serve our clients. We work with clients in a variety of ways including strategy consulting, business model development, solution design services, advisory, research and content development and collaborative facilitation.

THOUGHT LEADERSHIP

We provide our clients with rigorous analysis and unique insights to support the development of new growth strategies and solutions. Our research, content and modeling work provides an ideal context for discovery and ideation. We combine market intelligence with creative decision making forums in a mutually supportive mode.

UNIQUE PROCESSES

There is no simple "linear" process to drive new smart systems innovation. Iterative, nonlinear methods are important because design innovation is a process of exploration and discovery. Our methods facilitate new thinking and unexpected concepts and ideas that drive tangible customer and market impact.

VIBRANT COMMUNITY

Building new smart systems and digital growth ventures requires new and different modes of design, development and collaboration. We tap our community of innovators and thought leaders to help organizations push the boundaries of collaboration to include new and unfamiliar participants that help foster new insights and creative perspectives.

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