M2M to IOT Market Perspective

Chapter outline

- M2M Communication
- M2M and IoT
- M2M to IoT A Basic Perspective
- M2M Value Chain
- IoT Value Chain
- An emerging industrial structure for IoT

Machine 2 Machine (M2M)

- M2M refers to those solutions that allow communication between devices of the same type and a specific application, all via wired or wireless communication networks.

- Machine-to-Machine (M2M) communication is a form of data communication that involves one or more entities that do not necessarily require human interaction or intervention in the process of communication.

MACHINE TO MACHINE (M2M)

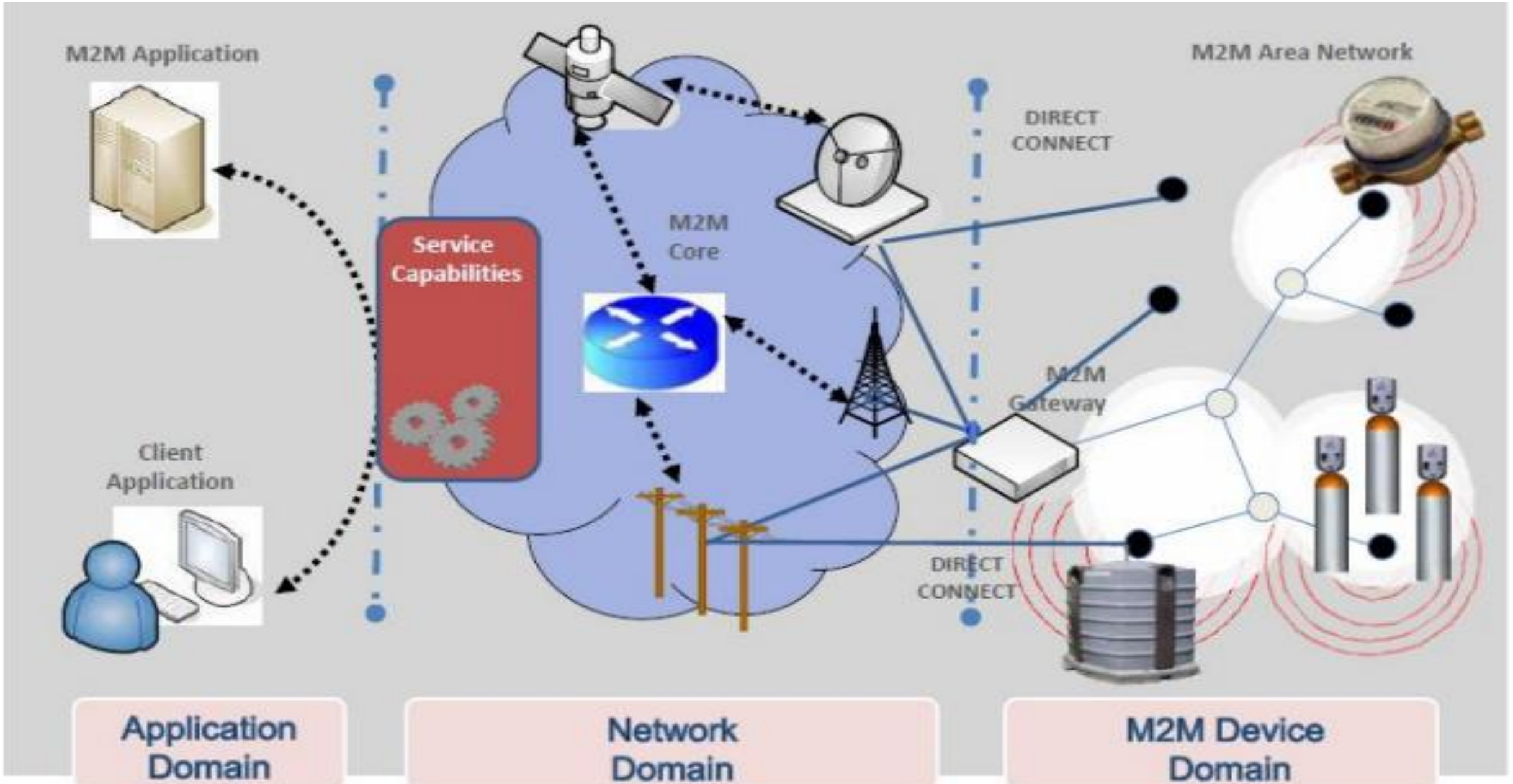
- Device which is monitored by means of sensor (Ex: Water level)
- Device which is instructed to actuate. (Ex: Actuators)

MACHINE **TO** MACHINE (M2M)

- Network which facilitates end-to-end connectivity between machines
- Composed of radio, access network, gateway, backend server

MACHINE TO **MACHINE**

- Device which extracts, processes and displays gathered information (Ex: Computer)
- Device which automatically controls and instructs other machines (Ex: Computer)



Architecture of M2M system

Difference between M2M and IoT

M2M	IoT
Point to point communication usually embedded within hardware at the customer site	Devices communicate using IP networks, incorporating with varying communication protocols
Many devices use cellular or wired networks	Data delivery is relayed through a middle layer hosted in the cloud.
Devices do not necessarily require an internet connection.	In the majority of cases, devices require an active internet connection.
Limited integration options, as devices must have corresponding communication standards.	Unlimited integration options, but requires a solution that can manage all of the communications.

M2M to IoT A Basic Perspective

- M2M and IoT (technology used for these solutions may be very similar). they may even use the same base components but the manner in which the data is managed will be different.

- In an M2M solution, data remains within strict boundaries. it is used solely for the purpose that it was originally developed for.

- With IoT, however, data may be used and reused for many different purposes, perhaps beyond the original intended design because of web-based technologies.

Some definitions

- **Global value chains (GVC)**

  A value chain describes the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond, including design, production, marketing, distribution, and support to the final consumer

FIGURE 3.2

A simplified global value chain.

Ecosystems vs. value chains

- **Business Ecosystems**
  - "an economic community supported by a foundation of interacting organizations and individuals . . .
  - The economic community produces goods and services of value to customers, who are themselves members of the ecosystem.

- The member organisms also include suppliers, lead producers, competitors, and other stakeholders.

- the IoT market as an "ecosystem," with multiple companies establishing loose relationships with one another in the ecosystem to deliver products and services to end-users and customers.

Ecosystems vs. value chains

- A value chain is a useful model to explain how markets create value and how they evolve over time.
- While a market space composed of only competing value chains will eventually see the overall market value decrease (as they will compete only on price), in an ecosystem, the value chains will complement one another.

M2M value chains

- M2M applications have and will be in the near future developed for some form of business process optimization.
- M2M vary from project to project and company to company, but can include things such as cost reductions through streamlined business processes, product quality improvements, and increased health and safety protection for employees.
- let's take a look at the inputs and outputs of an M2M value chain.
- **Inputs:** Inputs are the base raw ingredients that are turned into a product. Examples could be **cocoa beans for the manufacture of chocolate** or data from an M2M device that will be turned into a piece of information.
- **Production/Manufacture:** Production/Manufacture refers to the process that the raw inputs are put through to become part of a value chain. For example, **cocoa beans may be dried and separated before being transported to overseas markets.** Data from an M2M solution, meanwhile, needs to be verified and tagged for provenance

M2M value chains

- **Processing:**
  - Processing refers to the process whereby a product is prepared for sale.
  - For example, cocoa beans may now be made into cocoa powder, ready for use in chocolate bars.
  - For an M2M solution, this refers to the aggregation of multiple data sources to create an information component something that is ready to be combined with other data sets to make it useful for corporate decision-making.

- **Packaging:**
  - Packaging refers to the process whereby a product can be branded as would be recognizable to end-user consumers.
  - For example, a chocolate bar would now be ready to eat and have a red wrapper with the words "KitKat" on it.
  - For M2M solutions, the data will have to be combined with other information from internal corporate databases, for example, to see whether the data received requires any action. This data would be recognizable to the end-users that need to use the information, either in the form of visualizations or an Excel spreadsheet.

M2M value chains

- **Distribution/Marketing:**
  - This process refers to the channels to market for products.
  - For example, a chocolate bar may be sold at a supermarket, a kiosk, or even online.
  - An M2M solution, however, will have produced an Information Product that can be used to create new knowledge within a corporate environment examples include more detailed scheduling of maintenance based on real-world information or improved product design due to feedback from the M2M solution.
- M2M value chains are internal to one company and cover one solution.
- IoT Value Chains, meanwhile, are about the use and reuse of data across value chains and across solutions.

IoT value chain

- Let's take a closer look at a possible IoT value chain, including an Information Marketplace,
- **Inputs:**
  - The first thing that is apparent for an IoT value chain is that there are significantly more inputs:
    - Devices/Sensors
    - Open Data ("A piece of data is open if anyone is free to use, reuse, and redistribute it")
    - OSS/BSS : The Operational Support Systems and Business Support Systems of mobile operator networks are also important inputs to information value chains, and are being used increasingly in tightly closed information marketplaces that allow operators to deliver services to enterprises.
    - Corporate Databases: supply chain management, payroll, accounting, etc.

IoT value chain

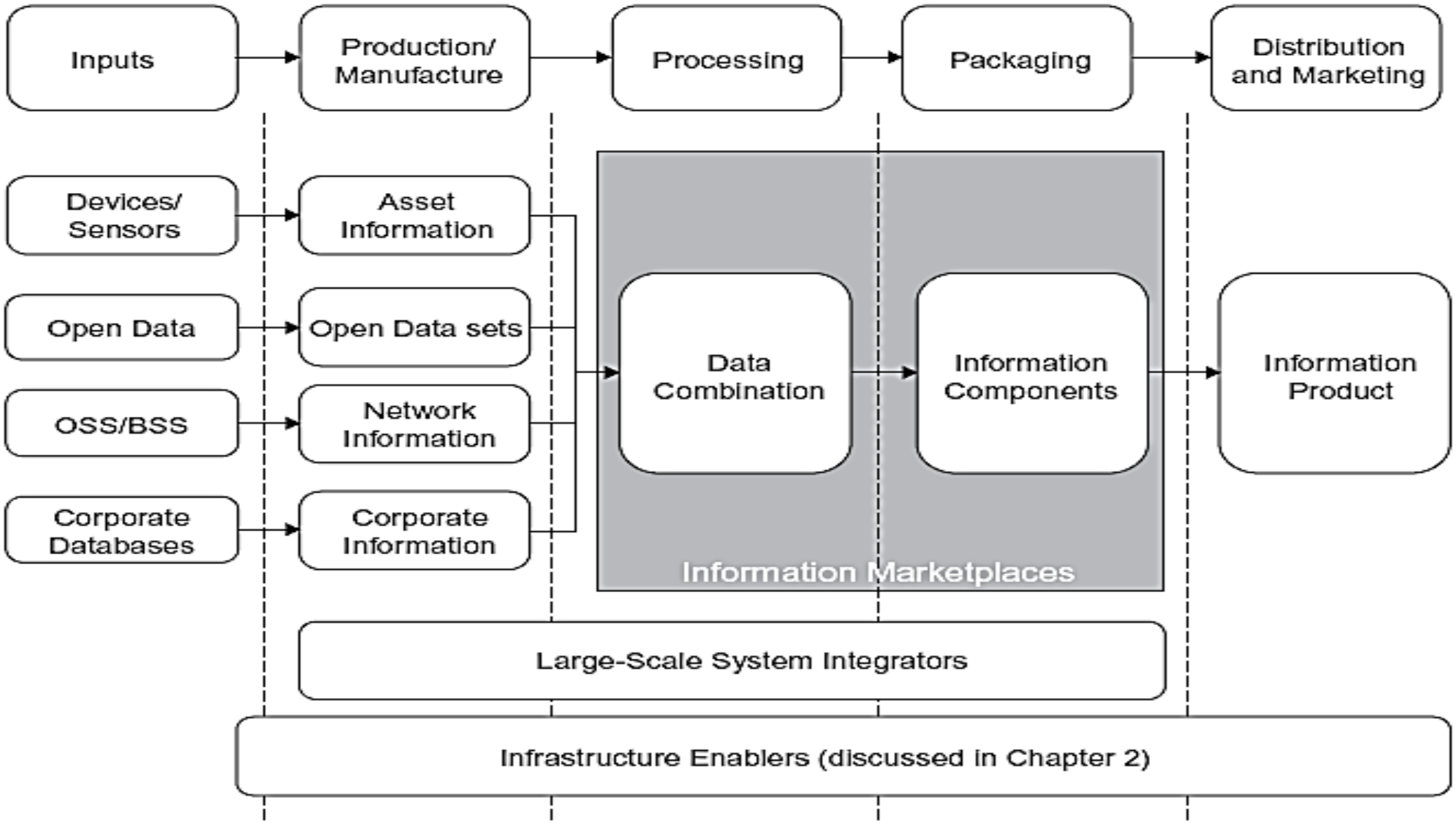
- **Production/Manufacture:**
  - the raw inputs will undergo initial development into information components and products.
  - Some examples:
    - **Asset Information:** Asset information may include data such as temperature over time of container during transit or air quality during a particular month. Essentially, this relates to whatever the sensor/device has been developed to monitor.
    - **Open Data Sets:** Open data sets may include maps, rail timetables, or demographics about a certain area in a country or city.
    - **Network Information:** Network information relates to information such as GPS data, services accessed via the mobile network, etc. . . .
    - **Corporate Information:** Corporate information may be, for example, the current state of demand for a particular product in the supply chain at a particular moment in time.

IoT value chain

- **Processing:**
  - During the processing stage, data from various sources is mixed together. At this point, the data from the various inputs from the production and manufacture stage are combined together to create information.
- **Packaging:**
  - After the data from various inputs has been combined together, the packaging section of the information value chain creates information components. These components could be produced as charts or other traditional methods of communicating information to end-users.

IoT value chain

- **Distribution/Marketing:**
  - The final stage of the Information Value Chain is the creation of an Information Product.
  - They fall into two main categories:
    - **Information products for improving internal decision-making:**
      - These information products are the result of either detailed information analysis that allows better decisions to be made during various internal corporate processes
    - **Information products for resale to other economic actors:**
      - These information products have high value for other economic actors and can be sold to them.
      - For example, through an IoT solution, a company may have market information about a certain area of town that another entity might pay for (e.g. a real-estate company).


Inputs
Production/ Manufacture
Processing
Packaging
Distribution and Marketing
Devices/ Sensors
Asset Information
Open Data
Open Data sets
OSS/BSS
Network Information
Corporate Databases
Corporate Information
Data Combination
Information Components
Information Product
Information Marketplaces
Large-Scale System Integrators
Infrastructure Enablers (discussed in Chapter 2)

An emerging industrial structure for IoT

- Technologies of the industrial revolution integrated physical components together much more rapidly, M2M and IoT are about rapidly integrating data and workflows that form the basis of the global economy at increasing speed and precision.
- Today , billions of devices are connected to mobile and cloud computing have the ability to provide low cost access to computational capacity for these billions of end-users via these mobile devices.
- Combined, these two technologies create a platform that will rapidly redefine the global economy.
- A new form of value chain is actually emerging as a result - one driven by the creation of information, rather than physical products.
- With each generation of platform, a new type of system integrator has emerged. (like IOT)

An emerging industrial structure for IoT

- information about individuals is now captured, stored, processed, and reused across many different systems that sit on top of the mobile broadband platform. This data has always existed, but with the increasingly low cost of computing capacity in the form of cloud computing platforms, it is now cheap enough to store this data for an extremely long length of time.
- It is now possible, therefore, for information about individuals and digital systems to be packaged, bundled, and exchanged between economic entities with an ease that has previously been impossible.
- Actors that perform this data collection, storage, and processing are forming the basis of what may be viewed as an Information-Driven Global Value Chain (I-GVC), a value chain where the product is information itself.

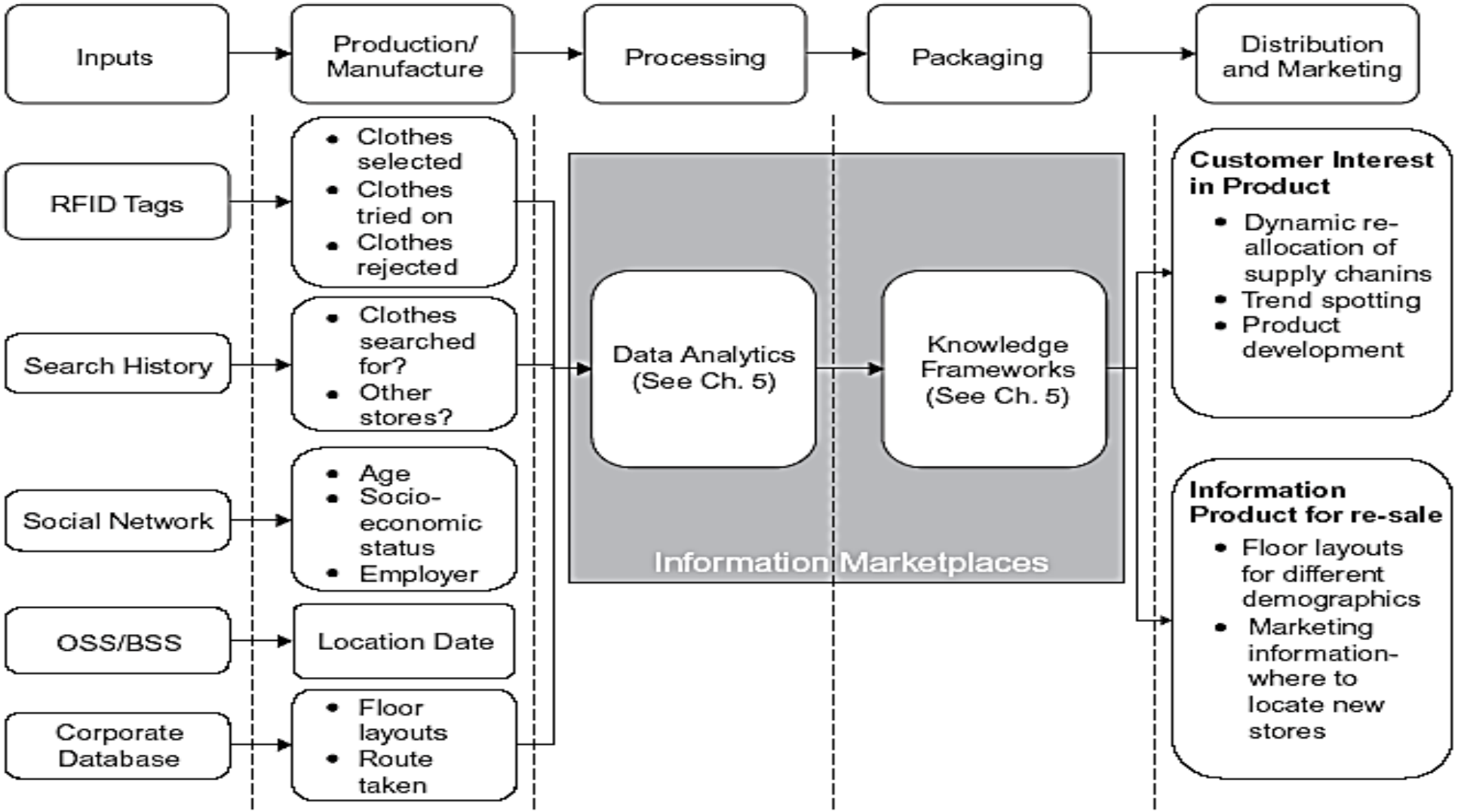


FIGURE 3.4

An Information-Driven Value Chain for Retail.

An emerging industrial structure for IoT

- The information-driven global value chain (I-GVC)
    - There are five fundamental roles within the I-GVC
        - Inputs:
            - Sensors, RFID, and other devices.
            - End-Users.
        - Data Factories.
        - Service Providers/Data Wholesalers.
        - Intermediaries.
        - Resellers.