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The Many Contexts of Software Architecture

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Chapter Outline



Architecture in a Technical Context
Architecture in a Project Life-Cycle Context
Architecture in a Business Context
Architecture in a Professional Context
Stakeholders
How Is Architecture Influenced?
What Do Architectures Influence?
Summary

Contexts of Software Architecture



- Sometimes we consider software architecture the center of the universe!
- Here, though, we put it in its place relative to four contexts:
 - Technical. What technical role does the software architecture play in the system or systems of which it's a part?
 - Project life cycle. How does a software architecture relate to the other phases of a software development life cycle?
 - Business. How does the presence of a software architecture affect an organization's business environment?
 - Professional. What is the role of a software architect in an organization or a development project?

Technical Context



- The most important technical context factor is the set of quality attributes that the architecture can help to achieve.
- The architecture's current technical environment is also an important factor.
 - Standard industry practices
 - Software engineering techniques prevalent in the architect's professional community.
- Today's information systems are web-based, object-oriented, service-oriented, mobility-aware, cloud-based, social-networking-friendly.
 - It wasn't always so.
 - It won't be so ten years from now.

Project Life-cycle Context



- Software development processes are standard approaches for developing software systems.
- They impose a discipline on software engineers and, more important, teams of software engineers.
- They tell the members of the team what to do next.
- There are four dominant software development processes:
 - Waterfall
 - Iterative
 - Agile
 - Model-driven development

Architecture Activities



- All of these processes include design among their obligations.
- Architecture is a special kind of design, so architecture finds a home in each one.
- No matter the software development process, there are activities involved in creating a software architecture, using that architecture to realize a complete design, and then implementing or managing the evolution of a target system or application:
 - 1. Making a business case for the system
 - 2. Understanding the architecturally significant requirements
 - 3. Creating or selecting the architecture
 - 4. Documenting and communicating the architecture
 - 5. Analyzing or evaluating the architecture
 - 6. Implementing and testing the system based on the architecture
 - 7. Ensuring that the implementation conforms to the architecture

Business Context



Architectures and systems are not constructed frivolously.
They serve some business purposes.
These purposes may change over time.

Architecture and Business Goals



- Systems are created to satisfy the business goals of one or more organizations.
 - Development organizations want to make a profit, or capture market, or stay in business, or help their customers do their jobs better, or keep their staff gainfully employed, or make their stockholders happy, or a little bit of each.
 - Customers have their own goals for acquiring a system, usually involving some aspect of making their lives easier or more productive. Other organizations involved in a project's life cycle, such as subcontractors or government regulatory agencies, have their own goals dealing with the system.
- Architects need to understand who the vested organizations are and what their goals are. Many of these goals will have a profound influence on the architecture.

Architecture and Business Goals



- Every quality attribute—such as a user-visible response time or platform flexibility or ironclad security or any of a dozen other needs—should originate from some higher purpose that can be described in terms of added value.
 - “Why do you want this system to have a really fast response time?”
 - This differentiate the product from its competition and let the developing organization capture market share.
- Some business goals will not show up in the form of requirements.
- Still other business goals have no effect on the architecture whatsoever.
 - A business goal to lower costs might be realized by asking employees to work from home, or turn the office thermostats down in the winter, or using less paper in the printers.

Architecture and business goals

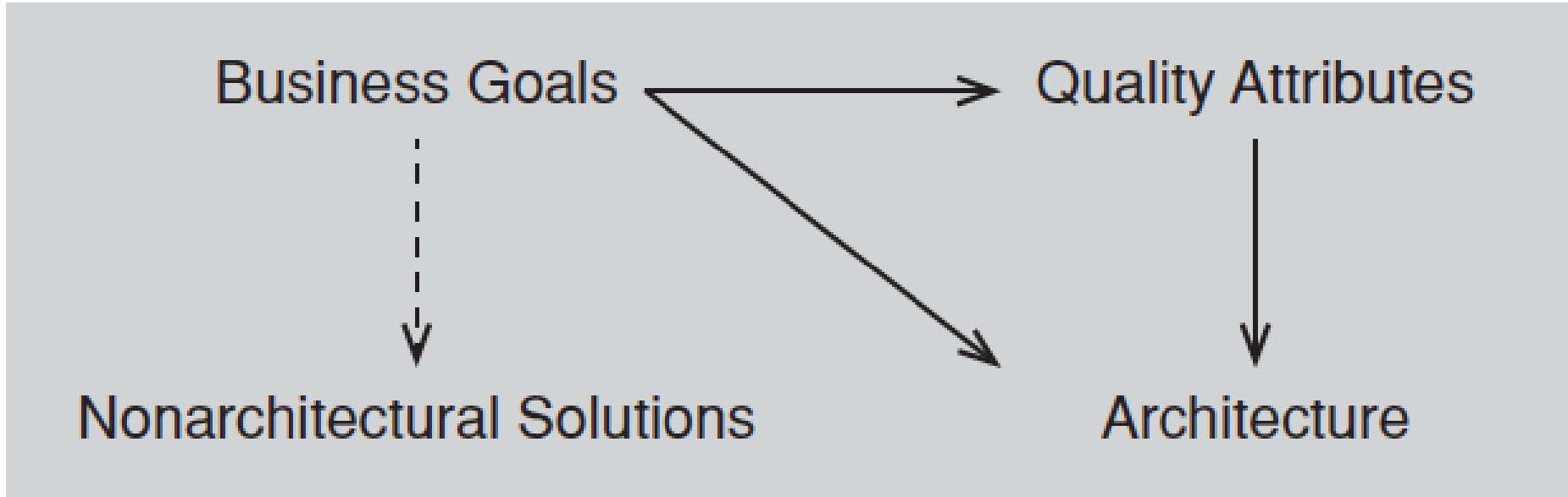


FIGURE 3.2 Some business goals may lead to quality attribute requirements (which lead to architectures), or lead directly to architectural decisions, or lead to nonarchitectural solutions.

Professional Context



You will perform many *duties* beyond directly producing an architecture.

- You will need to be involved in supporting management and dealing with customers.

Architects need more than just technical *skills*.

- Architects need to explain to one stakeholder or another the chosen priorities of different properties, and why particular stakeholders are not having all of their expectations fulfilled.
- Architects need diplomatic, negotiation, and communication skills.
- Architects need the ability to communicate ideas clearly
- You will need to manage a diverse workload and be able to switch contexts frequently.
- You will need to be a leader in the eyes of developers and management.

Architects need up-to-date *knowledge*.

- You will need to know about (for example) patterns, or database platforms, or web services standards.
- You will need to know business considerations.

Stakeholders



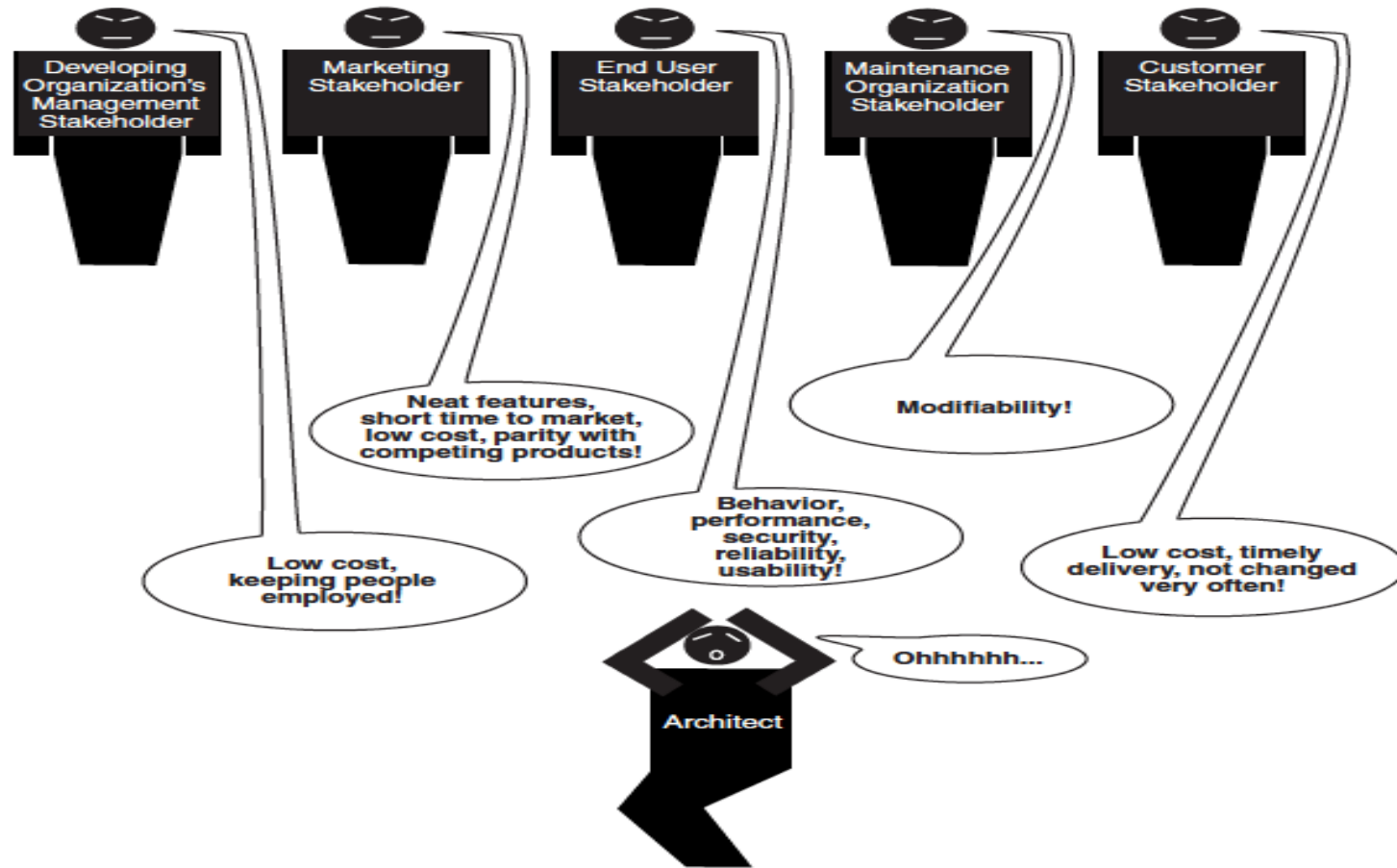
- A stakeholder is anyone who has a stake in the success of the system
- Stakeholders typically have different specific concerns that they wish the system to guarantee or optimize.
- You will need to know and understand the nature, source, and priority of constraints on the project as early as possible. Therefore, you must identify and actively engage the stakeholders to solicit their needs and expectations.
- Early engagement of stakeholders allows you to understand the constraints of the task, manage expectations, negotiate priorities, and make tradeoffs.

Stakeholders



- Know your stakeholders!
- Talk to them, engage them, listen to them, and put yourself in their shoes.
- See Table for a list of example stakeholders and their interests and concerns.

Stakeholders



How is Architecture Influenced?



- Requirements influence the architecture, of course.
- But the requirements specification only begins to tell the story.
- A software architecture is a result of business and social influences, as well as technical ones.
- The existence of an architecture in turn affects the technical, business, and social environments that subsequently influence future architectures.
- In particular, each of the contexts for architecture plays a role in influencing an architect and the architecture.

How is Architecture Influenced?

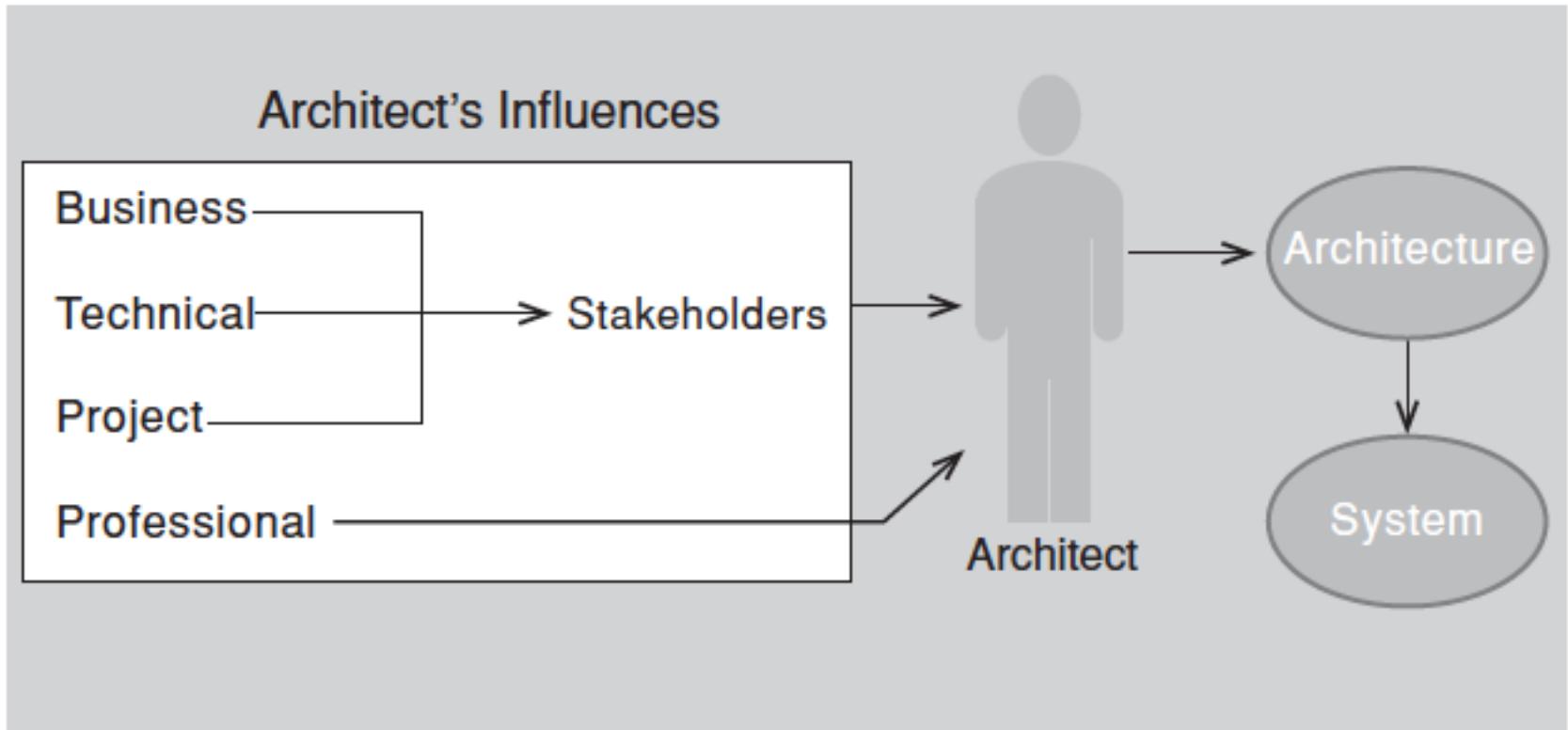


FIGURE 3.4 Influences on the architect

What Do Architectures Influence?



Technical context

- The architecture can affect stakeholder requirements for the next system
- It gives the customer the opportunity to receive a system (based on the same architecture) in a more reliable, timely, and economical manner than if built from scratch.
- A customer may in fact be willing to relax some of their requirements to gain these economies.
- Shrinkwrapped software has clearly affected people's requirements by providing solutions that are not tailored to any individual's precise needs but are instead inexpensive and (in the best of all possible worlds) of high quality.

What Do Architectures Influence?



Project context

- The architecture affects the structure of the developing organization.
- An architecture prescribes the units of software that must be implemented (or otherwise obtained) and integrated to form the system.
- These units are the basis for the development project's structure.
- Teams are formed for individual software units; and the development, test, and integration activities all revolve around the units.
- Teams become embedded in the organization's structure.

What Do Architectures Influence?



Business context

- The architecture can affect the business goals of the developing organization.
- A successful system built from an architecture can enable a company to establish a foothold in a particular market segment.
- The architecture can provide opportunities for the efficient production and deployment of similar systems, and the organization may adjust its goals to take advantage of its newfound expertise to plumb the market.

What Do Architectures Influence?



Professional context

- The process of system building will affect the architect's experience with subsequent.
- A system that was successfully built around a particular technical approach will make the architect more inclined to build systems using the same approach in the future.
- Architectures that fail are less likely to be chosen for future projects.

Architecture Influence Cycle

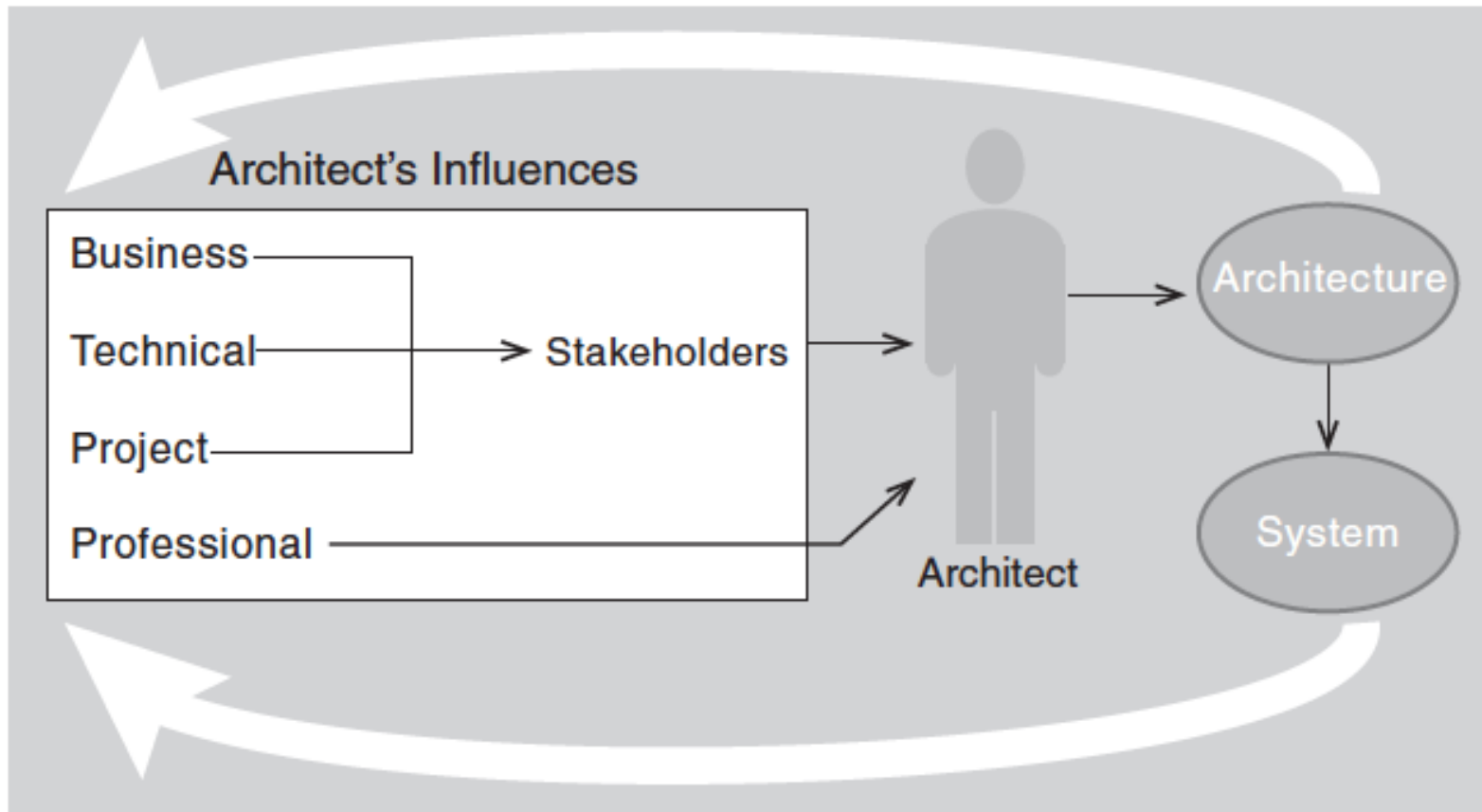


FIGURE 3.5 Architecture Influence Cycle

Summary



- Architectures exist in four different contexts.
 - Technical. The technical context includes the achievement of quality attribute requirements.
 - Project life cycle. Regardless of the software development methodology you use, you must perform specific activities.
 - Business. The system created from the architecture must satisfy the business goals of a wide variety of stakeholders.
 - Professional. You must have certain skills and knowledge to be an architect, and there are certain duties that you must perform as an architect.
- An architecture has influences that lead to its creation, and its existence has an impact on the architect, the organization, and, potentially, the industry.
- We call this cycle the Architecture Influence Cycle.