IDS SCHEER
Business Process Excellence

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= Business Performance Management

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1. Business Performance and Business Process Management

Although Business Performance Management and Business Process Management share the same abbreviation (BPM) and both are intended to boost corporate performance, they take different approaches. Business Process Management is about optimizing an organization's specific business processes and focuses more on operational aspects, while Business Performance Management is more global, but also more intangible given its emphasis on financial data. Because the financial indicators for a given period are the result of the business processes executed, the two concepts are closely related. The aim of Business Process Management and Business Performance Management is to gear the business processes of every department and the work of every employee toward improving performance (fig. 1). This requires awareness of business processes and business process transparency. Business Process Management covers the entire process lifecycle – from strategic planning and actual design to operational management, analysis, and monitoring. Business process outcomes give rise to the financial indicators that measure global performance. To improve performance, business processes must first be analyzed and then either streamlined (to reduce costs) or aligned with customer requirements (to boost revenues).

Given the close parallels between Business Performance Management and Business Process Management, in the following text the abbreviation "BPM" denotes a combination of both approaches. If special aspects of one of the approaches are being stressed, the full name will be used.

In recent years, Business Process Management – i.e., the organizing of end-to-end workflows – has undergone various mutations and been repeatedly fine-tuned.

Process-driven ERP (Enterprise Resource Planning), for example, supports the business process-oriented introduction of ERP systems.

This involves describing the actual business processes, developing a target concept, and tightly coupling design and technology to implement the concept in ERP systems.

About the author:

Prof. Dr. Dr. h.c. mult. August-Wilhelm Scheer

founded IDS Scheer AG in 1984. The author is also founder of imc AG and Chairman of its Supervisory Board.

In 1975, he become one of Germany's first professors of Business Computing and established the Institut für Wirtschaftsinformatik (IWi, the Institute for Information Systems) at the University of Saarland. The focus of his research activities is information and business process management in industry, the service sector, and public administration. Professor Scheer has received many awards, including the Philip Morris Research Award, the Erich Gutenberg Arbeitsgemeinschaft Award, and Germany's Federal Cross of Merit (First Class), and he remains actively involved in the academic and business communities in a variety of positions. He also holds several honorary doctorates. In 2007, he was elected President of BITKOM, the German Association for Information Technology, Telecommunications and New Media.

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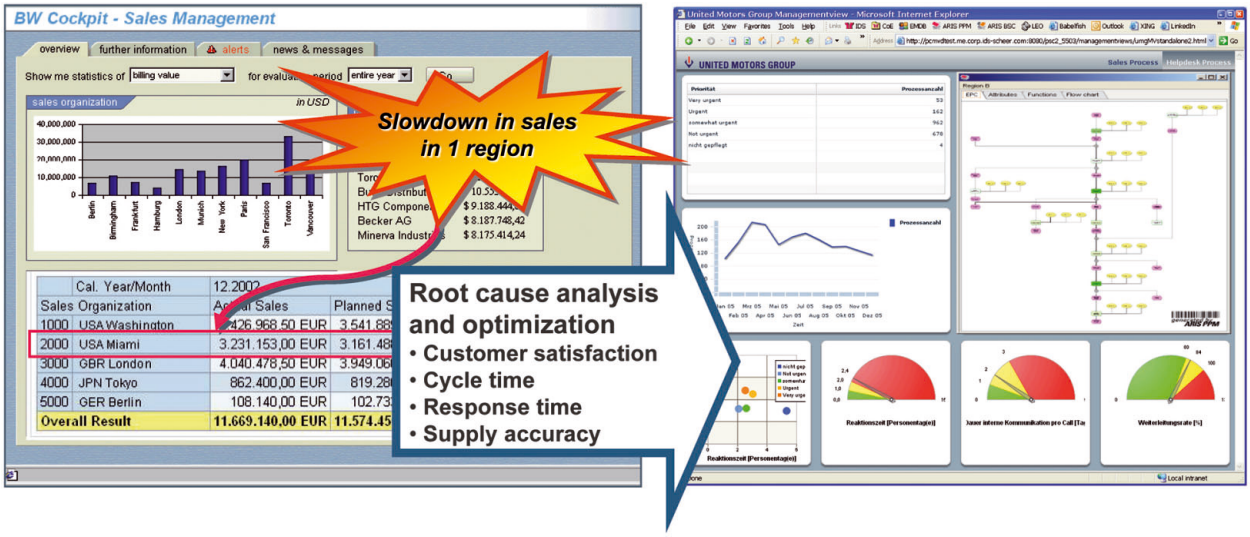


Figure 1: Analysis of business processes

Enterprise Architecture describes how information systems are structured and records their relationship with the business processes they support. This ensures transparent documentation and management of applications and the underlying technical systems. It forms the basis for an ERP system covering IT activities.

Enterprise BPM is a complete lifecycle concept for mapping and optimizing business processes from an organizational perspective.

Governance, Risk & Compliance (GRC) ensures that a company's business processes comply with statutory rules and organizational policies.

Process Intelligence & Performance allows organizations to efficiently track their business processes, from execution through to period-based reporting. Analyzing the discrepancy between target and actual values allows improvement options to be identified, thus enabling continuous optimization of business processes.

Business-Driven SOA supports the definition of services within an SOA architecture from a corporate process perspective. A key aspect of this approach is that business processes must be split into self-contained subprocesses, which are supported by services, in order to define technical services.

IDS Scheer provides methods, software, and consulting support for all these applications worldwide.

2. The Path to Business Performance (Process) Management

New organizational concepts and new IT technologies generally go hand-in-hand. If a new organizational concept is developed that cannot be supported by existing information systems, it will not advance beyond concept status and will not be capable of successful implementation. One example is Computer Integrated Manufacturing (CIM), which was developed in the 1980s to integrate all the technical and business applications of a manufacturing entity and link them on a process basis. Although the CIM concept had merit from a business and organizational viewpoint, it failed because the available information systems were not sophisticated enough. There were no database systems, the individual business and technical applications used different file concepts, there were no standardized network concepts, dialog processing was still in its infancy, and computer performance was inadequate. These practical constraints discredited the entire organizational concept. It was revived in the late 1990s after IT had caught up, enjoying success under a variety of names: Product Lifecycle Management, Engineering Database Management, Supply Chain Management, etc.

Similarly, new technologies not backed by new application concepts that deliver real business value are also doomed to fail.

To succeed, new technologies need to coincide with new business organization concepts.

An application that enables an (existing) technology to become mainstream is referred to as a "killer application" – i.e., it "kills" a previous technology and replaces it with a new one. Examples of killer applications are spreadsheet and word processing programs, which paved the way for the success of personal computers; e-mail and the World Wide Web, which established the Internet as a technical network infrastructure; and the MP3 player that created support for the MP3 format.

BPM is the killer application for an organization's entire information processing activities. Investment in technical information systems and the success of such systems depends on the ability of information technology to boost company performance.

For this reason, the BPM method will be considered from two perspectives: the organizational, application-based view (BPM application wheel) and the underlying technology view (BPM technology wheel). The application view comprises 10 aspects and the technical view 9. Each is displayed in the form of a wheel (fig. 2), in which the spokes represent how the criteria have developed, with maturity increasing from the rim toward the "BPM" axle. The development process is divided into three phases, each of which is based on an approximate period of time. The first phase began in the mid-1980s, the second at the end of the 1990s, while the third phase represents the current status and extends into the future. Because each phase tends to build on the previous one, companies can still benefit from earlier phases, even if they have reached a more advanced stage.

3. BPM Application Wheel

Figure 2 shows the structure of the application wheel, indicating possible approaches to BPM.

As indicated by the "phase" arrow, the right-hand side of the wheel shows how IDS Scheer's major BPM concepts have evolved, i.e. from the ARIS House for describing business processes to the House of Business Engineering for process management, through to the current (advanced) process performance concept.

Let's take a brief look at the individual criteria. The first criterion refers to the objects analyzed as part of BPM (e.g., data, processes, business rules), followed by the various types of process (e.g., operational, support, governance), and the time aspect (past, present, or future-oriented). The lifecycle criterion indicates whether BPM comprises all phases – from strategy and design to realization and controlling/monitoring – or only parts thereof. User Groups differentiates between the involvement of technical experts only, business process owners, or all business users within the enterprise. Control Structure describes whether the processes considered are well structured, semi-structured, or unstructured (knowledge-based). Time Horizon distinguishes between strategic, tactical, and operational applications, while Abstraction Level categorizes business events as paper documents, digital information, or the physical objects of the processes themselves. Scope differentiates between project-oriented application, single business areas, and company-wide BPM. Metrics are broken down into financial indicators, multi-dimensional indicators (such as quality, quantity, and time), and a coherent company-wide KPI concept.

These BPM aspects will now be described in more detail. A graphical representation of the different phases is included for each section of the application wheel. The description follows the above sequence, i.e., it commences with the evolution of the IDS Scheer roadmap and then discusses each spoke of the wheel in turn, proceeding counter-clockwise from the phase arrow.

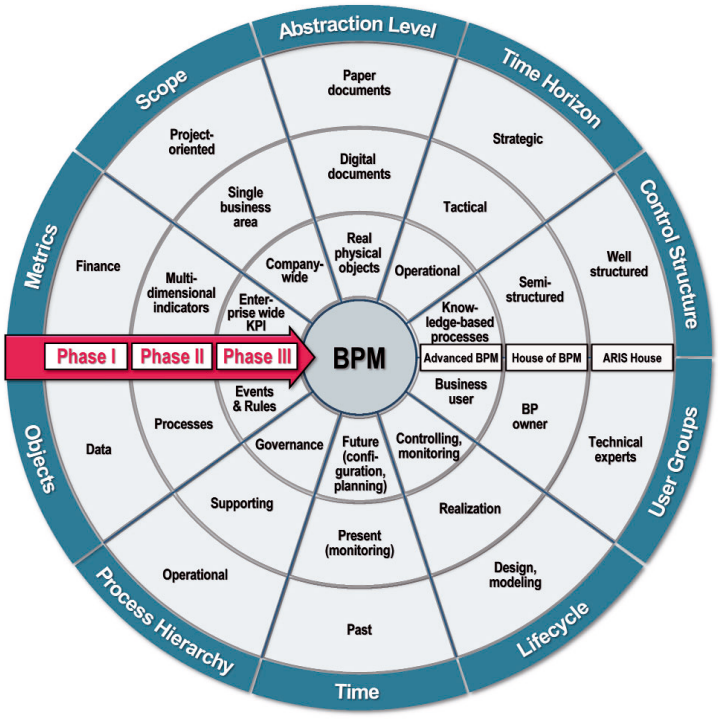


Figure 2: BPM application wheel

3.1 IDS Scheer BPM Roadmap

The ARIS House was created by the author as a basic concept for describing business processes (ARIS – Architecture of Integrated Information Systems, first edition 1991, fourth and current edition 2002, entitled "ARIS – From Business Process to Application System"). It forms an architecture of business processes that is independent of IT implementations and describes the different possible views of a business process. The organization view contains the organizational units involved in the business process, such as departments, plant and equipment, employees, and employee profiles. The data view describes the documents and data structures used in the business process. The function view documents the processing and transformation rules for the transactions executed during the business process, while the performance view describes the materials required by the process and the results generated by the individual functions and the business process. The control view integrates the various views of the business process.

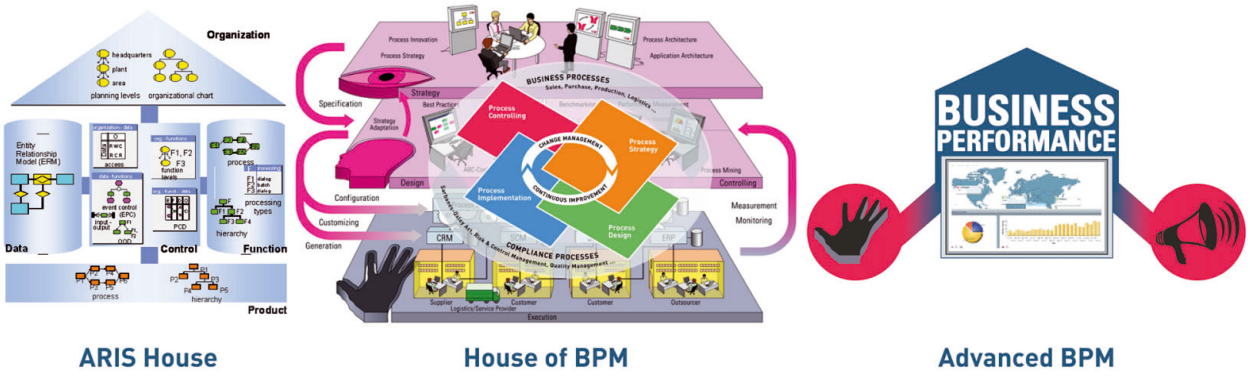


Figure 3: BPM concepts

The core of the ARIS House, the ARIS metamodel, shows the methods used to describe the individual views via their description objects and relationships. It comprises some 250 object types and relationship types. The development lifecycle model with its business concept, IT concept, and implementation phase provides a consistent way of describing a process both in business terms and with regard to its IT implementation.

The House of Business Engineering was created by the author as a lifecycle concept for Business Process Management (ARIS – From Business Process to Application System, third edition 1998, page 38 ff.). The first level shows how a company's core processes are identified from a strategic viewpoint. The "Y" model developed by the author can be used here to represent the core operational processes of each organization. These comprise the development of new products (services) and the link between products and the procurement and sales markets (logistics). At the second level, the actual and target core processes are described (modeled) in detail. At the third level, implementation, description content is linked to the information systems – effectively the machinery that supports business processes. Using IT to link the second and third levels greatly simplifies and supports the process of customizing and configuring packaged software. For software systems developed in-house, there is the option of automatically transferring the content of the second level to a software development environment (e.g., UML or BPEL, and products that build on them). Links between the levels are highlighted by the lifecycle model in the middle. Feedback from the implementation level about business processes actually executed (process instances) is analyzed at level 2 and compared with target values. This provides important information for continuous improvement of business processes. Any key structural insights into business processes are fed back into the strategic design. All three levels are supported by IDS Scheer software, with the feedback provided by ARIS Process Performance Manager being particularly important.

"Advanced BPM" refers to IDS Scheer's current concepts and products, which enable tighter control of process execution. As in the House of Business Engineering, the hand symbol indicates the execution level and is supported by new products from IDS Scheer, right through to BPM workflow. The alarm symbol denotes event control, with business rules triggering responses to events generated by live processes. The dashboard in the center shows modern BPM user interfaces featuring mashup techniques, with user-specific configuration and integrated external data sources.

3.2 BPM Objects

Data (see fig. 4) describes the results of business activities, rather than the activities themselves. Nonetheless, with many forms of analysis – especially data warehouse methods – analysis is focused on such data. It describes the outcome of business activities for a certain period, a sales territory, or an organizational unit, enabling statistical evaluations and comparisons. Although using data models to describe data structures is a useful aid to configuring data warehouse systems, data analysis alone can only deliver limited organizational insights.

For this reason, when it comes to business process concepts, analysis is applied to the process organization itself, i.e., the processing functions, their process logic, the organizational units involved, and the deliverables, as defined by the ARIS concept. By 1990, Business Process Management had largely superseded the function-oriented approach of Taylorism, with the result that business process design and analysis is now the primary focus of BPM.

Business process models map all process execution options held to be significant. This can result in a large number of confusing branches in the case of complex processes. One important means of reducing description complexity is to extract the rule knowledge that controls branching and make it part of separate rule documentation. The rules are described and handled by software components called rules engines. Rules are assigned to events, with each different occurrence of an event causing the process to take the appropriate route.

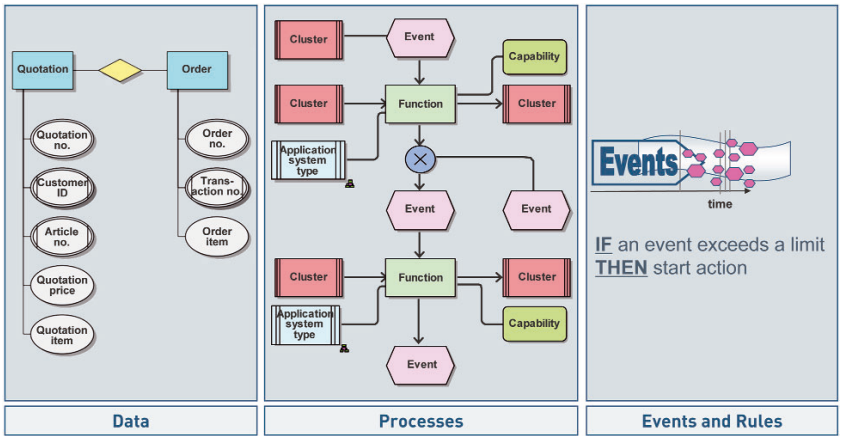


Figure 4: BPM objects

At the execution level, rules engines can support process control by workflow systems. Business process descriptions can then be restricted to the more basic processing functions, with the rules engine ensuring that rules interpret events as they occur and activate the relevant process branch. Because real-time control of business processes requires event control and knowledge of the rules, business process management thus comprises events, rule knowledge, and action (function) descriptions.

3.3 Process Types

Business process management can refer to different types of business processes, which are displayed in a hierarchy in fig. 5. Operational business processes are closely associated with an organization's production activities and how its performance is defined. The "Y" model in the inner circle describes core operational processes. The right-hand arm of the "Y" stands for the service/product development process, represented in the example here by the systems used to develop physical products in a manufacturing company. The left-hand arm describes the logistics involved, i.e., how the products are linked with the procurement and sales markets and, in the lower section, how production orders are linked with the data that describes the products. The manufacturing sector adopted a process approach to supporting the production process at an early stage. The need to make maximum use of expensive plant and equipment led to the introduction of process control methods and systems, which enabled detailed process management of production orders. In addition, feedback for cost analysis purposes via simultaneous costing and timely target/actual analysis of times, quantities, and quality created a process feedback loop in software systems for production control. However, Business Process Management was not pursued to the same extent in higher-level areas, i.e., forward-looking logistics planning and product development.

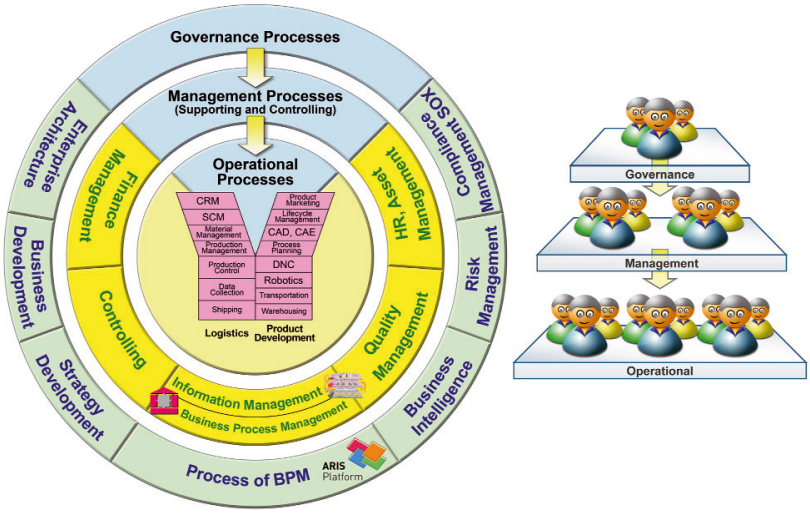


Figure 5: Process hierarchy

Support and control processes – i.e., management processes – are required in order to align operational business processes with corporate objectives, in particular with regard to revenues and costs. In the financial sphere, this entails mapping transactions with external partners in Accounting and internal processes being examined from the cost perspective by Controlling. Information management supports operational processes by providing the appropriate IT systems, quality management tracks operational processes in terms of quality standards, and HR and asset management supply operational processes with the necessary resources. While operational processes are the domain of the employees who work on the related process objects, management processes are focused on supervisory and managerial staff. Their job is to optimize the structure of operational processes, although they are only involved in actual object processing of operational transactions in exceptional cases.

The outer circle in figure shows governance processes. These processes are designed around the needs of senior management and relate to the organization as a whole.

Governance processes have acquired special significance in recent years, with the behavior of some senior executives at scandal-plagued companies coming under fire. In the interests of transparent corporate management, dedicated processes are therefore essential. Enterprise architecture processes render the structure of information systems transparent. Without this level of transparency, it is impossible to ensure compliance with rules on access control and user authorization.

Business development describes processes pertaining to the organization's growth, such as expanding the product range or acquiring new divisions.

Corporate strategy development covers processes for describing methods and responsibilities involved in developing strategic plans and making the associated decisions.

BPM also needs a process to define methods, responsibilities, and activities. The same applies to providing company data for business intelligence, risk management, and compliance management purposes.

3.4 Time

The data generated by business processes can be presented in various forms by using reporting tables (see fig. 6). Since this data relates to completed transactions, it represents historical information. Although comparison with plan data can deliver interesting information as the basis for more detailed analysis, the reality of historical data cannot be altered.

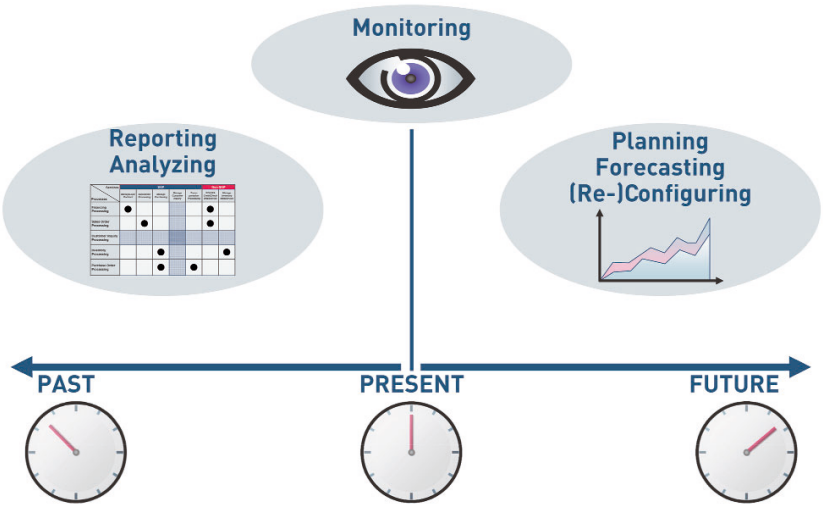


Figure 6: Time

By contrast, monitoring involves tracking live business processes and revealing their current status. This makes it easier to identify processes that look likely to deviate from target values and underperform. Monitoring thus combines looking at individual business processes with viewing more recent data. Immediate action can then be taken to avoid undesirable results.

Companies are placing increasing emphasis on future developments and probability-based prediction, using current monitoring information and what-if functionalities.

Continuous organizational improvement is also intended to better equip companies for the future. This continuous improvement requires flexible information systems, which can be re-customized and re-configured in accordance with the latest organizational insights. Developing new, service-oriented software architectures (SOAs) offers corresponding implementation options.

3.5 BPM Lifecycle

Business Process Management is based on a lifecycle concept comprising methods that support the design of optimized business processes (i.e., the design phase) and subsequent implementation of the associated execution systems. This close coupling of design phase and implementation ensures that the models created in BPM projects are translated into corporate reality.

Process monitoring allows analysis of target/actual deviations, with the results being available for ongoing Business Process Management. If the deviations are significant, business process strategy is also re-examined. Process strategy is a record of the organization's core processes, in which they are aligned with future business development. The cycle of strategy, design, implementation, and monitoring enables an organization to adapt continuously to market changes, technology advances, and new organizational concepts. It maintains the company's impetus as a living organism and supports organizational change management in response to a longer-term view, while also allowing continuous business process improvement based on a short- and medium-term view.

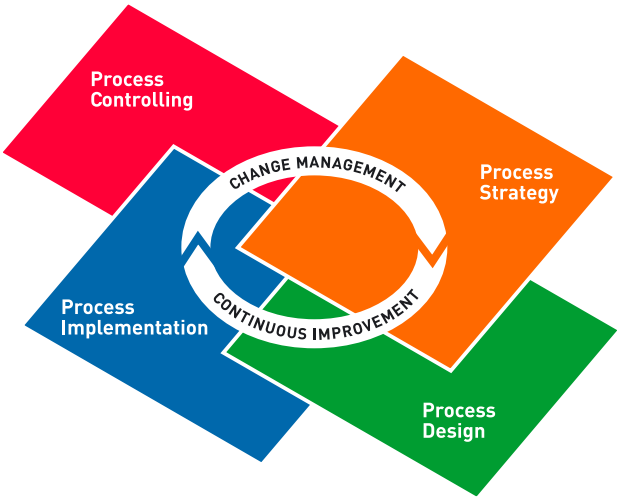


Figure 7: BPM lifecycle

3.6 BPM User Groups

The first generation of BPM discussions saw the concept being addressed to specially selected experts within the organization (see fig. 8). Business process modeling was usually performed by trained specialists, often recruited from the company's IT department. Organizational activities were then carried out and changes applied to the business processes. Business process owners were appointed, being chiefly entrusted with management functions, i.e., designing and managing processes. Although this expanded the BPM user group to include non-IT experts, only by involving all employees can performance be improved across the entire company. The performance mindset must be embedded throughout the enterprise before BPM can become the process and performance philosophy that takes the company forward. This gives rise to new challenges in terms of user-friendly information provision and technical user interfaces for BPM tools.

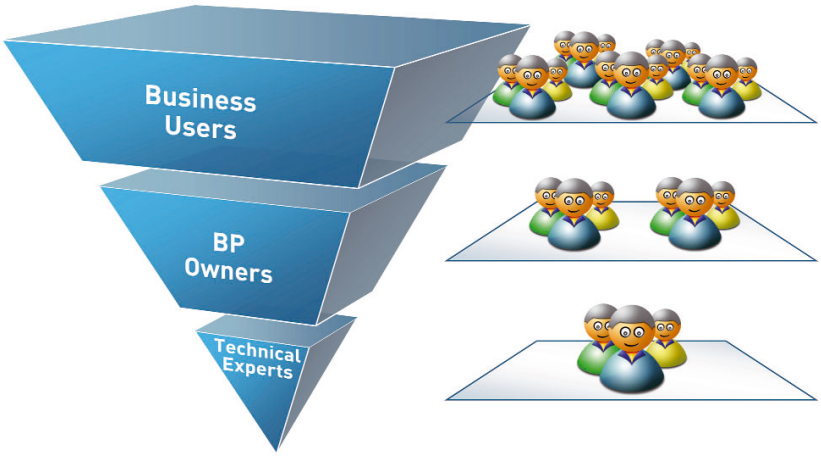


Figure 8: BPM user groups

3.7 Control Structure

Business processes can be categorized as well structured, semi-structured, or unstructured (see fig. 9), with the latter also being referred to as knowledge-based processes. Well structured processes are so named when the functions to be executed, the sequence in which they take place, and the associated process control can be accurately described in advance. This category typically includes operational business processes that are often repeated, such as procurement processes and sales processes.

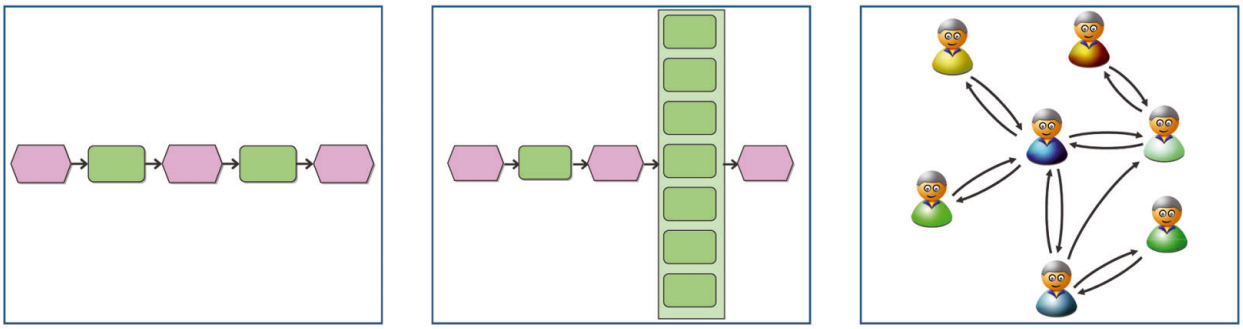


Figure 9: Process-control structure

Parts of semi-structured processes can be well defined in advance, but others cannot be specified in full, as a result of either the type of functions to be executed or the sequence in which they occur. Figure 9 shows that although the functions to be executed after the first function are known, the sequence cannot be determined yet. Negotiations concerning the terms of a major contract would be a typical example of this case: Although the individual items are known, the order in which they are dealt with is not fixed until the discussion starts and it is also possible that the negotiators will return to previous items during the course of their talks.

Unstructured processes are even more difficult to describe in advance. Processes to develop new product ideas or corporate strategies, which invariably involve a significant degree of creativity, frequently have no fixed transaction description or process structure. Often, the only information available is the list of participants and an intentionally unstructured agenda designed to encourage wide-ranging discussion, rather than to impose limits. In such cases, the "process model" focuses on describing the organizational units involved (roles, individuals) and their main interaction relationships.

Depending on the various control structures, different forms of IT support are needed. In the first case, traditional application systems (ERP, SCM, CAM, etc.) can be used. In the second, workflow control is recommended, which gradually adds process structure by defining ad hoc structures between functions initially recorded only as a transaction list. In the third instance, more communication support is required by way of groupware tools and Web 2.0 community functionalities.

3.8 Time Horizon

BPM enables various periods to be selected as the basis for action. A long-term concept will focus on strategic issues, such as identifying core processes, their critical success factors, and scope for innovation.

Where the focus is on the medium term, tactical issues come to the fore, e.g., analyzing performance indicators and comparisons between different locations or with industry benchmarks.

With operational, short-term process and performance control, the spotlight is on monitoring current processes, combined with analyzing deviations and potentially taking direct remedial action.

Operational process and performance control requires IT systems to provide data in a very timely fashion and deliver maximum transparency. Thus the more short-term the focus, the more flexible information systems need to be. This leads logically to real-time process control and the concept of a real-time enterprise.

3.9 Abstraction Level

The aim of Business Process Management is to control workflows. The work to be created can initially be represented by paper documents (see fig. 10) that contain planning information and details of progress made and results achieved. Because creating and presenting this information takes time, the status and results are often not up-to-date.

If data is captured directly from the work creation process in digital form, it is more timely. Changes in medium between the work object and its recording and presentation on paper are largely replaced by direct data transfer from the work process into a digital representation. Nevertheless, there is still an abstraction step between the actual work objects and the digital information that represents them.

The third phase sees the work objects themselves becoming information senders and receivers. Instead of work data being received from information systems that merely represent the workflow, the objects themselves send status reports to an information system and can also forward messages to other objects independently. This enables local control of business processes by the work objects themselves. An object can inquire about the availability of the resources needed for the next processing step and independently navigate its way through the processing stations.

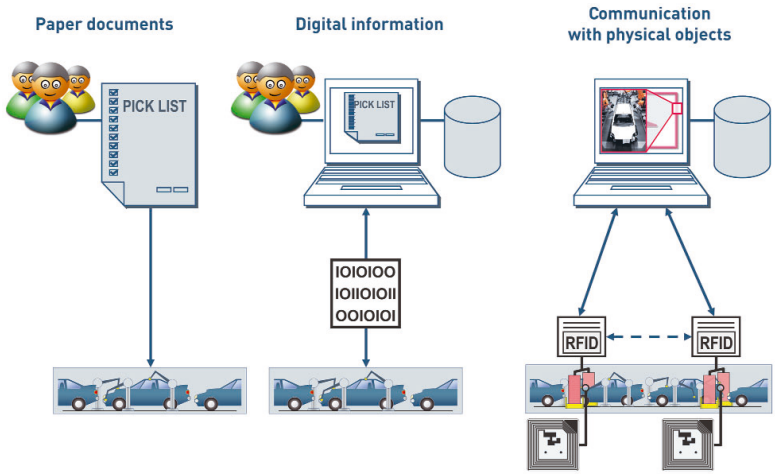


Figure 10: Level of abstraction

This trend will be given huge momentum by technologies, such as RFID and the "Internet of Things" – which is widely regarded as the next generation of Internet technology. Creating ad hoc networks between objects in the event of a fault or hazardous situation without human intervention will lead to automatic, autonomous business process control.

3.10 Scope

When Business Process Management takes place as part of organizational change, the approach is more project-oriented. For example, a change of information systems generally only involves certain departments and the project runs for a limited time (see fig. 11).

However, if a complete business unit is reorganized and new business process structures and management systems put in place, a more far-reaching approach without any time limits applies.

If the entire organization adopts a process-oriented approach, with business process owners being designated for all business process types and comprehensive performance indicators defined, the result is the desired holistic business process organization, which seeks to permanently align all processes with improved business performance.

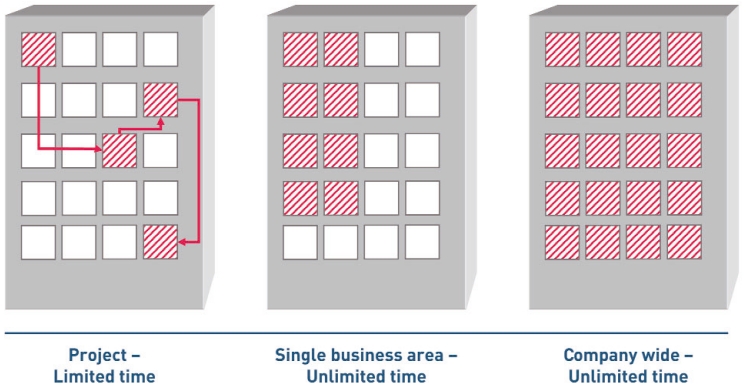


Figure 11: Organization scope

3.11 BPM Metrics

Where management of business processes and business process performance is purely finance-based, the results of corporate processes are recorded in terms of revenues and costs (see fig. 12). However, financial data is often aggregated in a way that makes it impossible to gain a proper view of quantity and quality factors, thereby making detailed analysis of the root cause of deviations difficult. The key to detailed analysis and control of business processes is the use of more extensive performance metrics, such as quantities, quality, time, organizational reshuffles, etc.

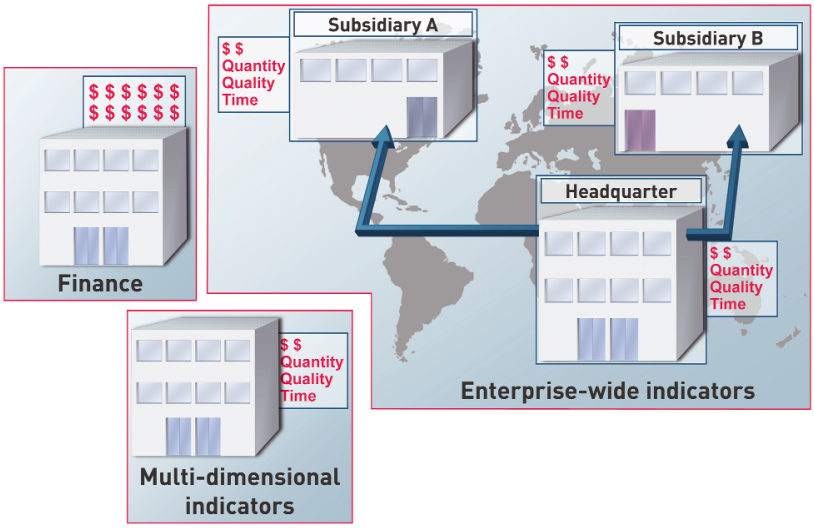


Figure 12: BPM metrics

If these metrics are used across the enterprise, cross-location benchmark comparisons can be made, thereby enabling identification of best practices and more focused optimization.

Enterprise-wide definition of multi-dimensional metrics places significant demands on the consistency of information systems. Direct comparisons are only possible if business processes are defined with the same level of detail and can be tracked with the same degree of precision. In addition, information must be provided quickly to enable timely benchmark comparisons.

4. BPM Technology Wheel

Many of the above points have illustrated the close correlation between new management concepts and advances in information technology. A BPM technology wheel (see fig. 13) will now be presented to match the application wheel. Here again, the individual aspects are divided into three rough phases, each of which demonstrates advances in IT. Because the technologies build on each other, previous levels are not necessarily "inferior." Rather, meaningful use can be made of what went before when deploying advanced technologies. The wheel charts the development of the technologies listed below. Where modeling is concerned, a distinction is made between a stand-alone modeling tool, ERP integration, and comprehensive, model-driven software development and configuration.

(Business) Software Architecture tracks the development from data integration via a business process platform to a service-oriented architecture.

Database technology starts with an enterprise-wide database featuring a standardized SQL interface, continues with data warehousing methods with analysis-oriented data structuring, and ends with in-memory technology, which can dramatically improve the speed of analysis through storing most data in main memory.

Communication begins with mailing systems that provide support for asynchronous communication between users. Portal technology enables multiple users to work virtually simultaneously on the same task with transparent progress tracking by each user. The Web 2.0 community approach leverages the intelligence of groups that directly exchange information around the world via a range of media.

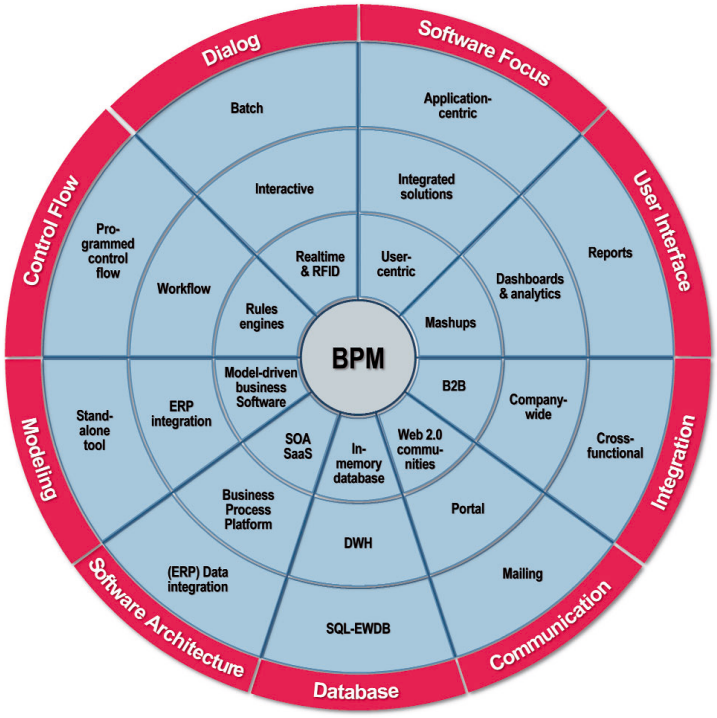


Figure 13: BPM technology wheel

(Process) Integration differentiates between combining individual functions on a process-oriented basis, company-wide process integration, and B2B, where processes are supported across corporate boundaries to include customers, suppliers, and partners.

The development of the User Interface comprises three phases: reports in table form, graphics-oriented dashboards with analytic functionality, and mashup technologies, which enable users to link internal and external data sources and configure the interface themselves.

Software Focus charts the shift from an application-centric approach to integrated solutions and user-centric design.

Dialogue between humans and information systems has evolved from asynchronous batch processing to interactive system use and management by users to the concept of a real-time enterprise.

The Control Flow in software progresses from a hard-coded flow, which cannot be changed by the user, to workflow control with transaction selection options for the user, through to flexibly configurable, rule-based control.

Each criterion will now be described in greater detail with the aid of graphics.

4.1 Modeling

When a stand-alone modeling tool is used, modeling results are stored in the tool's repository (fig. 14). The data itself is not reused within the technology. Rather, it serves documentation purposes and supports the development of target concepts. The models are displayed on the screen in the form of graphics or printed out on paper in a large-scale format. Computer tools thus replace manual modeling on brown paper.

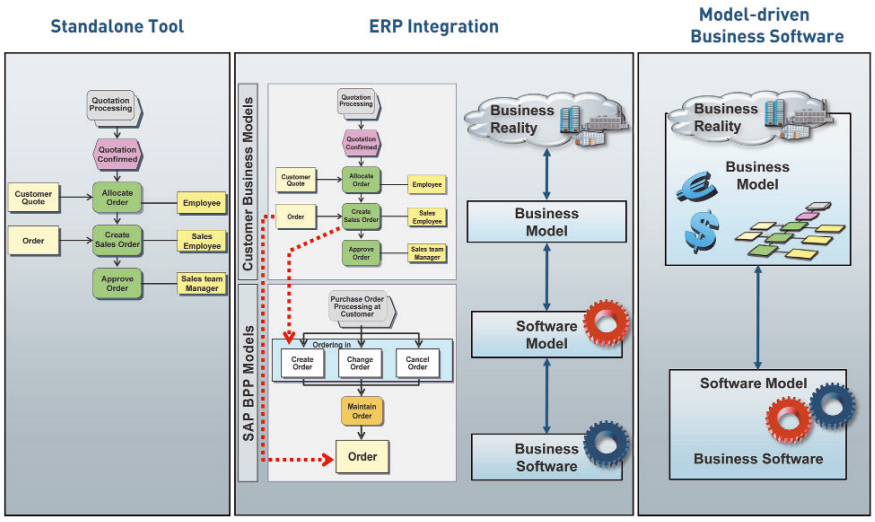


Figure 14: Modeling

For ERP integration to take place, enterprise software providers must have documented the process content of their applications using models. This started to happen 15 years ago and is now the standard way of documenting such systems. After the user has created process models using modeling tools, they need to be integrated into the ERP software models in order to configure the ERP software. This is achieved by data transfer to the ERP vendor's implementation tools or, more conveniently, by linking to the model repository of the ERP software. Uploading content from the ERP model repository into the modeling tool's repository enables computer-supported mapping. As a result, user-created model content can also be transferred to support customizing and configuration. This approach is currently deployed in the context of large enterprise software systems to connect user-based modeling with the documentation and models contained in packaged business management software.

This capability is supported by the ARIS system with regard to SAP enterprise software, whereby technical integration with the SAP Enterprise Service Repository enables model information to be migrated to the ARIS system for evaluation and transferred back to the SAP system. The ARIS system thus supports "business to models" activity, while the SAP system handles the "models to execution" aspect.

When enterprise software is model-driven, the link between modeling method and software product is even closer. Configuration and software customization is only possible via model settings and changes. The models do not merely document the enterprise software, they are physically connected to the software. Unrestricted, user-based modeling, i.e., defining business processes without reference to subsequent software support, remains important from an organizational viewpoint. However, the results can only be utilized further downstream if a close physical link exists to the application system's model repository.

This type of integration has been achieved with the SAP "Business ByDesign" solution and is also typical of the ARIS modeling tool.

Model-driven software development is also a feature of software development tools and can be regarded as a general software architecture trend of the future.

In addition to SAP Business ByDesign, ARIS therefore supports various execution engines at this integration level. Similar links also exist to key software architecture components, such as workflow systems.

4.2 Software Architecture

When ERP software first emerged, application modules were created for individual corporate functions. To execute a corporate process in its entirety, the implementer had to select transactions from different modules and link them. To support a purchasing process, for example, it was necessary to link ordering system transactions with transactions for bill of materials management, inventory management, quality assurance, accounting (accounts payable), and controlling. This was possible by using a uniform database that could be accessed by all functional application modules. Data structures were thus defined across the enterprise and could be used to integrate functions for supporting processes.

In the second phase of ERP software, the process concept was included in the architecture. In business process platforms, the middleware components needed to support processes are combined to create an integrated technical platform. Portal technology supports standardized user administration and standardized user access to the relevant business processes. Workflow technology is a core component of technical process control. Separating process control from the application systems and creating a special workflow engine as part of the business process platform makes process configuration more flexible. Changes to the process logic, such as sequencing of functions or logical function branches, can be carried out by reconfiguring the workflow engine, without the need to modify the application code.

Enterprise Application Integration (EAI) functionality supports technical integration of disparate systems. Information about the impact that data changes in one system have on another is managed in the EAI system's dedicated repository. The actual program systems remain unaffected.

B2B technology enables processes to be linked across company boundaries.

Breaking the software down into small units (services) that represent themselves to the world via standardized interfaces (e.g., Web Services Description Language (WSDL)) enables a corporate process to be flexibly configured via the middleware's process engine.

When used in conjunction with business process platforms and applications structured as services (SOA), this type of software architecture represents the most advanced solution currently available.

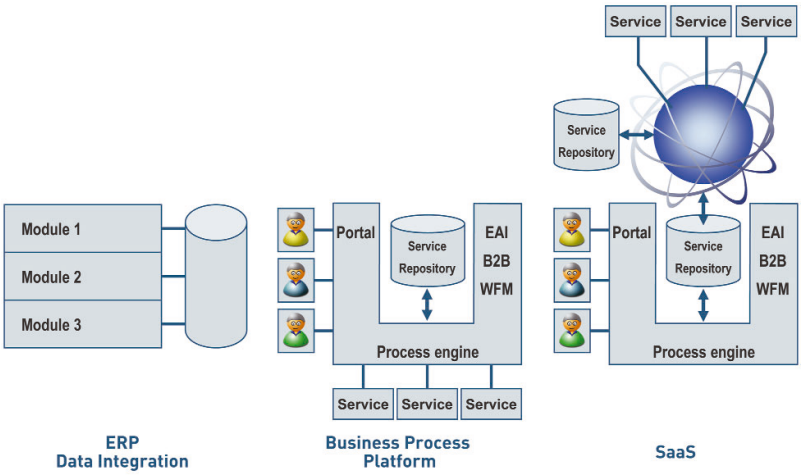


Figure 15: Software architecture

Software-as-a-service models, in which services are offered externally via the Internet rather than forming part of the user's own information system, are also set to become increasingly important in the future. Users call the services and the application is executed on the Internet. Hardware and software is available as required in virtually unlimited form (cloud computing). Because data storage and processing is handled on the Internet, users need only thin clients.

4.3 Database

The first phase of data management involved managing all operational data in a standardized database management system (fig. 16). The development of the SQL standard for relational databases and the emergence of non-proprietary database systems from vendors, such as Oracle, Sybase, and Microsoft, have allowed separation of data storage and application software to become the norm. Despite the development of the SQL standard, which was adopted by virtually all database system vendors, the majority of companies stick with the strategic database system of a single vendor in order to avoid the increased training and maintenance associated with using multiple systems. Use of standardized SQL database technology is focused on operational systems. SQL is too complicated for non-expert users who occasionally need to formulate ad hoc queries. In addition, evaluating extensive operational datasets to prepare management reports is too time-consuming.

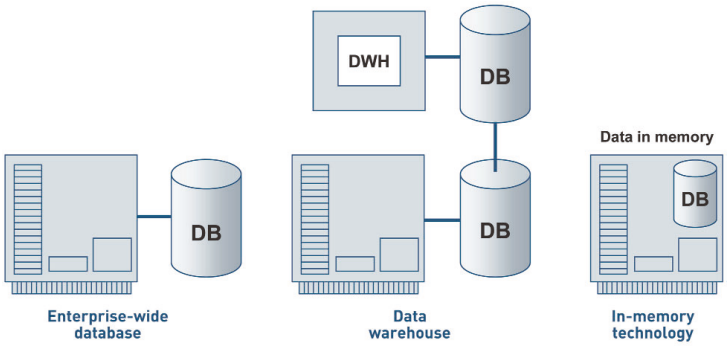


Figure 16: Database

The introduction of data warehouse technologies provided enhanced database options for intuitive reports and queries. Data is extracted from operational datasets into a new logical structure (data cubes), which was specifically designed to allow multi-dimensional evaluation. Data marts, i.e., additional compressed, dedicated data structures, can be created from data cubes for individual application views. The data warehouse approach can be regarded as one of the first comprehensive user-centric applications. Originally conceived as additional applications for operational business software, data warehouse solutions have since been bought up by major business software companies, such as SAP, Oracle, and IBM (e.g., Business Objects acquired by SAP, Hyperion by Oracle), with the result that they now form part of business software applications. However, there is still a need for analysis based on other existing applications, e.g., in-house legacy systems and process types not provided by packaged software vendors.

With the advent of processors with 64-bit addressing, enormous datasets can now be managed in the computer's main memory, enabling fast data warehouse applications without the delays associated with accessing external storage media. This in-memory technology will define data management for the next generation, in terms of both operational and analysis-oriented applications.

4.4 Communication

Sending e-mail between users, and between systems, allows asynchronous human-to-human, human-to-system, and system-to-system communication (fig. 17). For many applications, this kind of communication is perfectly adequate. Portal technologies enable users to communicate with each other simultaneously, each having a transparent view of the other's work progress, which is controlled by workflows.

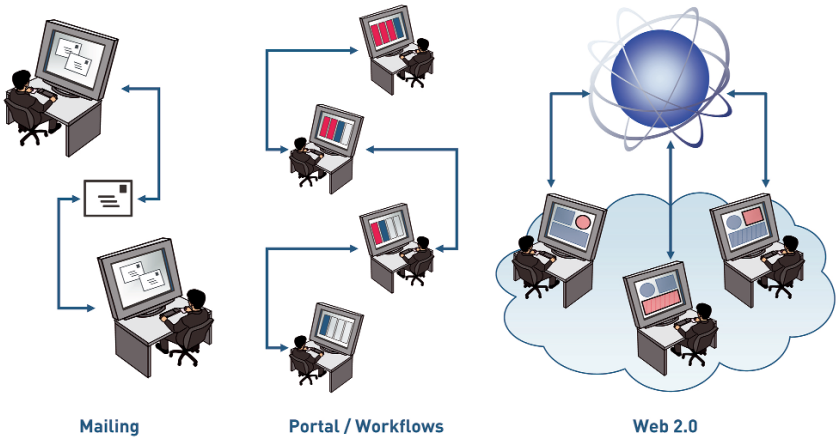


Figure 17: Communication

Web 2.0 technology supports communication between and among group members, who can exchange information worldwide over the Internet via a range of media. They pool their knowledge and skills in order to solve problems, each contributing and receiving knowledge as they work toward a shared solution.

4.5 Process Integration

Where an organization has adopted a process-oriented approach but only integrated individual process steps across multiple functions, the term "cross-functional" is used (fig. 18). A shared database is available for the integrated process functions.

A holistic, company-wide process approach involves support for all core processes.

With process-oriented B2B, the processes of various partners, such as suppliers and customers, are connected via agreed process definitions and data structures.

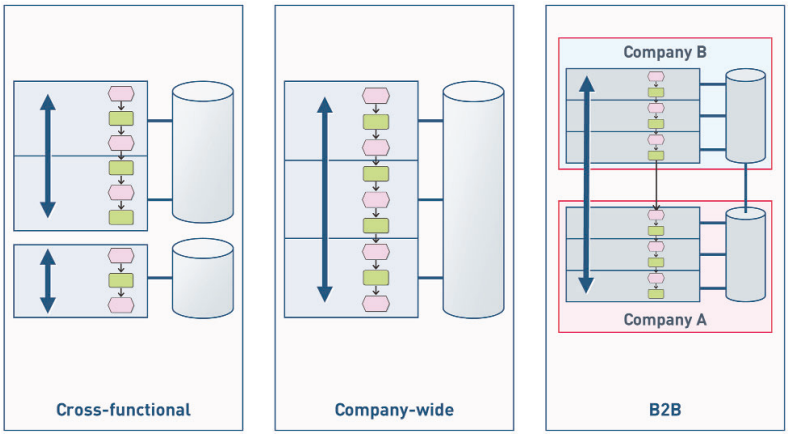


Figure 18: Process integration

4.6 User Interface

The trend toward user-centric computing means that user interfaces are also gaining in importance (fig. 19). Predefined reports with endless columns of figures are increasingly being replaced by intuitive dashboards with graphical interfaces. A dashboard is like a graphical control center for general business process management, which resembles systems that have long been used for production control. Starting with basic process data, drill-down technologies can deliver more detailed information about the process behavior of individual transactions (process instances).

Figure 19: User interface

New developments, e.g., mashup technologies, enable organizations to combine their own data and graphics on process behavior with external data, e.g., geographical information from Google. For example, plant-specific statistics can be positioned on a map.

3-D representations of different process models and their links provide a concise, easy-to-understand overview of process structures. Methods like virtual reality can be used when collecting process information and to display process results in a real-world manner. The use of virtual reality techniques thus reverses the process of abstraction from reality to model by going from abstracted model back to virtual reality.

4.7 Software Focus

In the initial phase of business software development, the focus was on supporting individual applications (fig. 20), based on predefined departmental definitions, which were typically structured according to function. The problem of interfaces between these application "islands" and their data silos is well documented.

The second phase involved the development of an integrated application concept for ERP systems using the uniform set of data referred to previously. Although application modules continued to reflect traditional business functions, they were now connected by virtue of using the same data definition.

With user-centric computing, the name says it all: users take priority, while data integration and process logic are regarded as a given. In addition, users can respond flexibly to unexpected events and deviations in process execution. The focus is on ergonomic user interface design and users also benefit from extensive analysis functionality on their terminals (or "rich clients"). This concept contrasts with cloud computing, where users need only thin clients because resources are provided online.

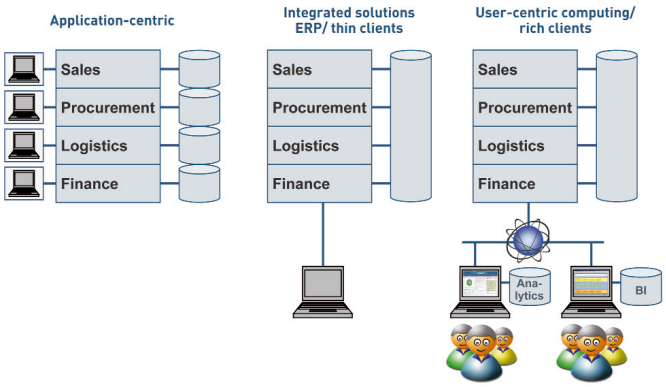


Figure 20: Software paradigm

4.8 Dialog

With batch processing, data input is separated from data output by a processing stage without any user involvement (fig. 21). The business transaction data is gathered, processed in a closed workflow, and output. This time gap makes it difficult for the user to combine output data with input data in order to analyze the results.

Interactive processing brings data input and processing closer together. Tasks are entered and processed individually, allowing errors, implausibilities, and unexpected events to be immediately identified and investigated. Having said that, examination of the actual underlying processing steps only takes place via data representations used by the information systems. Material flows are essentially mapped as information flows in the information system. Where processing steps are involved in which the machinery is the information system itself, the processing activity and its representation in terms of information technology are identical. This applies, for example, to the creation of a procurement order that exists only in digital form in the information system, where the procurement order object and its IT representation coincide.

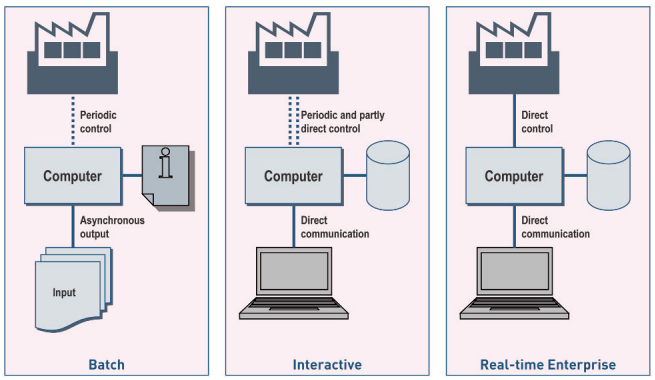


Figure 21: Dialog

In a real-time enterprise, this principle is applied across the board: all objects involved in creating and utilizing work are controlled in real time. This is also true of physical objects, with every physical processing object being linked to the information system via RFID technology. The objects send their status information to the system in real time and receive control information back, likewise in real time.

Direct communication between objects will also be supported in the future by the Internet of Things, enabling self-controlling objects and decentralized optimization of business processes via the intelligent control system to which they are linked.

4.9 Control Flow

In traditional application systems, the sequence of individual statements is hard-coded in the computer program (fig. 22). Users must execute the tasks in the order defined by the program system; the available options for executing individual transactions are limited. When a workflow system is introduced, transactions are placed in an in-tray for processing and removed from an out-tray after execution. Users can transfer transactions from the in-tray to their virtual desk and process them in accordance with their personal work schedule.

The use of rule engines splits out the process control logic embedded in workflow systems (e.g., logical branches or allocation to individual workstations), and transfers it to a separate rule control system. The rules can be individually described in business terms and are also easy to change, enabling flexible handling of organizational changes, such as modified payment terms. From a software-engineering perspective, moving the rules from process control into a separate rule engine is in keeping with the objective of creating smaller software units. Initially, data was separated from software, then flow control was made part of separate workflow systems, now workflow systems themselves are being broken down into a rule base and a component responsible only for technical control.

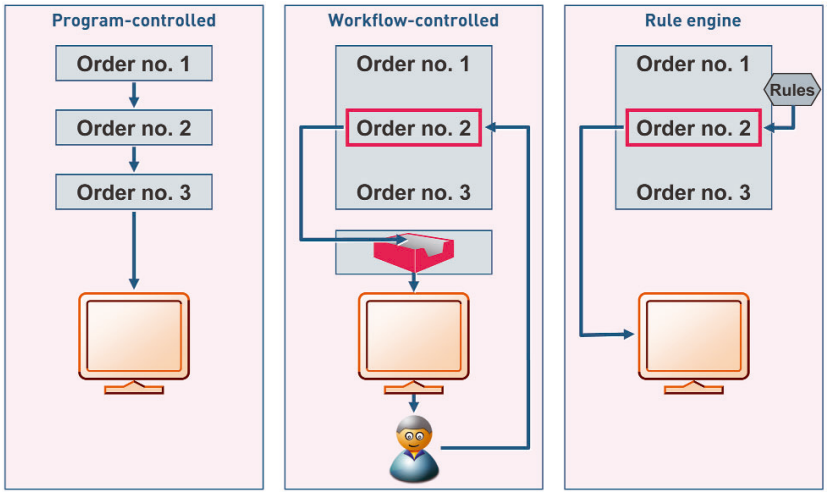
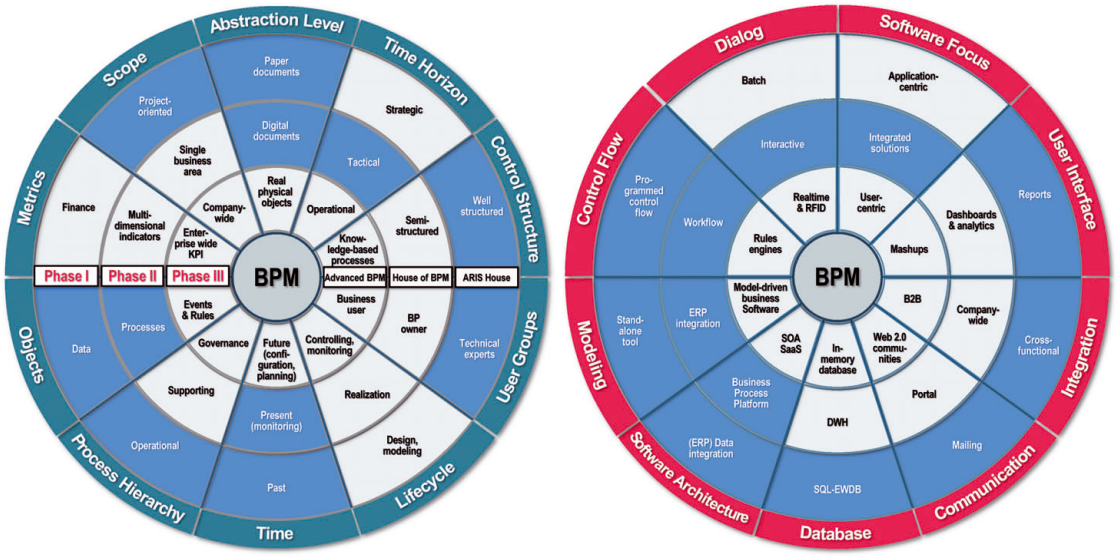


Figure 22: Control flow

Because service-oriented architectures also break down processing logic into smaller units, today's systems comprise numerous middleware components, which serve to link the processing steps, i.e., services. In contrast to the first generation of business software solutions, which were designed on the locality principle (organizing all the components of an application, such as functional processing, data, and process control, into one program), the splitting-up process focuses more on ease of changes, reuse of components, and structuring.

5. BPM Checkup

The application wheel and technology wheel can be used to evaluate any organization's BPM status ("BPM checkup"). Fig. 23 shows both views for a fictitious company.



BPM Application Wheel BPM Technology Wheel

Figure 23: BPM checkup

The existing applications and technologies used in the organization are colored dark blue.

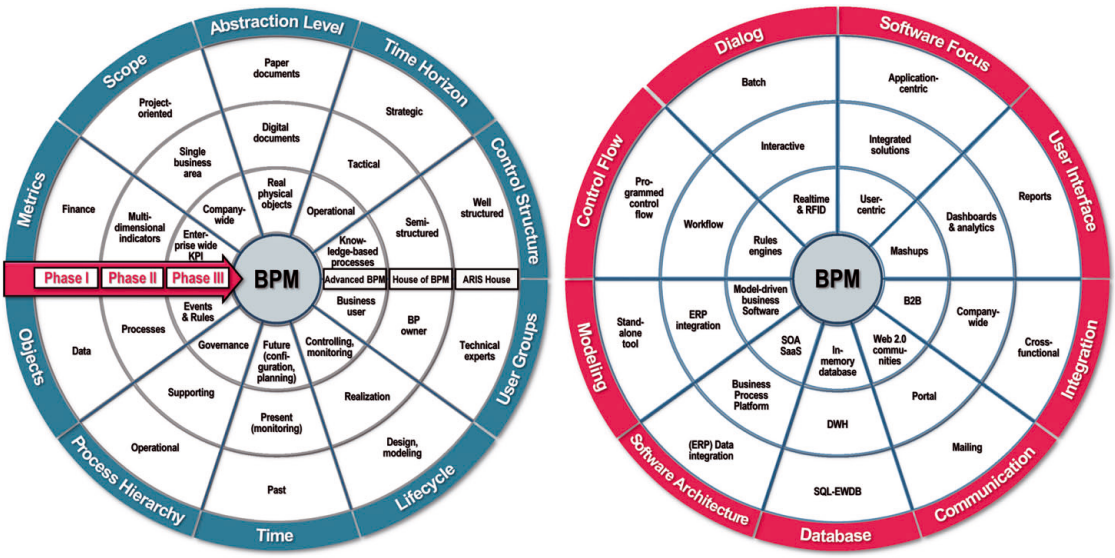
In terms of the application view, there are issues with metrics in the example: so far, BPM has only been used on a project basis, restricted to technical experts, and deployed for well-structured processes.

There is no blue in the inner circle, which relates to advanced application of BPM.

The technology view reveals the dominance of traditional database technology and use of a business process platform in the enterprise software segment. Here again, there is no blue coloring in the inner circle, indicating that the enterprise urgently needs to adopt a more sophisticated BPM strategy.

The blank wheels in figure 24 can be filled in to check the BPM status of your own organization.

Full-scale versions of all diagrams can be viewed at **www.professor-scheer-bpm.com**.



BPM Application Wheel BPM Technology Wheel

Figure 24: BPM checkup

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