

FAMILY OF PRACTICES – DESIGNING ARTEFACTS IN CONTEXT

Work in Progress

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1 Introduction

Artefacts are studied in different fields of science, including formal sciences, behavioural sciences and social sciences. For example, a study in theoretical computer science (formal science) could determine the complexity properties of a new algorithm for traversing a social graph. A study in psychology (behavioural science) could investigate how photo sharing on social networks influences stress levels. A study in business administration (social science) could examine how the adoption of ERP systems in companies affects their internal communication. In these cases, artefacts are not studied with a focus on human intentionality of the artefacts, i.e. focussing on the goals and functions the artefacts should address. Artefacts viewed from that stance are instead studied within design science research, where they are investigated as solutions to practical problems that people experience in practices (Goldkuhl, 2011; Holmström et al, 2009; Peffer et al, 2007).

When developing an artefact for a practice, it is required to have a deep and comprehensive understanding of the practice in which the artifact will be used. In particular, it is important to understand the problems experienced by stakeholders in the practice under consideration as well as artefact requirements posed by these stakeholders. However, restricting attention only to the practice in which the artifact will be used can be insufficient, as practices often are intertwined in complex and unexpected ways. For example, when developing an information system for a bank, the developers need to consider not only the banking practice but also the government practice of compliance monitoring. Thus, artifact design would need to take into account several related practices.

When developing artefacts for complex environments, a key activity is to identify and untangle related practices so that all relevant requirements can be unveiled. This is a non-trivial activity in a modern society that is characterized by a high degree of specialization and professionalization. Thus, the research question addressed by this paper is: “Which practices need to be considered in artefact design?”. The question is answered by introducing a conceptual model that makes explicit how practices can be related.

2 Practices and Artefacts

A practice is a set of human activities performed regularly and seen as meaningfully related to each other by the people participating in them. An example is the practice of dentists, who engage in cleaning teeth, drilling teeth, pulling out teeth, taking X-rays, and many other activities. When people engage in practices, they will typically need to handle natural as well as man-made objects. For example, dentists and dental nurses will repair teeth and make use of pliers, drills, X-ray machines, etc. Another example of a practice is cooking, where people cut fruit, fry meat, boil vegetables, marinate fish, and so on, while using stoves, refrigerators, pans, graters, and other kitchen utensils.

Practices can be more or less structured or formalized. Some practices take place within organizations, e.g. the production of cars in factories or the management of customer complaints in call centers. Other practices occur in informal settings, for example, kids playing balls in a backyard or people having dinner together. There are also practices in which people can engage as individuals, e.g. brushing their teeth or tying their shoelaces. In this paper, we restrict attention to organizational practices. A key characteristic of organizational practices is that they always have a goal, e.g. producing value for a customer.

3 A Model of Practice Symbiosis

In the modern world, organizational practices have multiplied as a consequence of specialization and professionalization. As a consequence, artefact design for practices needs to consider not only the

practice for which it is designed but also related practices in the environment. However, identifying these practices is a non-trivial problem. As a step towards support the identification and classification of relationships among practices, a conceptual model has been designed, see Figure 1.

The conceptual model has been inspired by the IDEF0 modelling technique (FIPS, 1993). The IDEF0 technique describes a system (e.g. organisation, IT system) as a number of functions (e.g. processes, operations, activities), graphically represented as boxes. In the conceptual model in Figure 1, the boxes represent practices.

The IDEF0 techniques also provide a set of channels conveying data or objects that are related to each function. These channels are represented as arrows associated to the box. In this paper, four types of channel from the IDEF0 technique are used: input (associated with the left side of a box), output (associated with the right side of a box), control (associated with the top side of a box) and mechanism (associated with the bottom side of a box). In the conceptual model in Figure 1, input and output arrows represent value chain relationships between the practices, control arrows represent management relationship between the practices, and mechanism arrows represent support relationships between the practices.

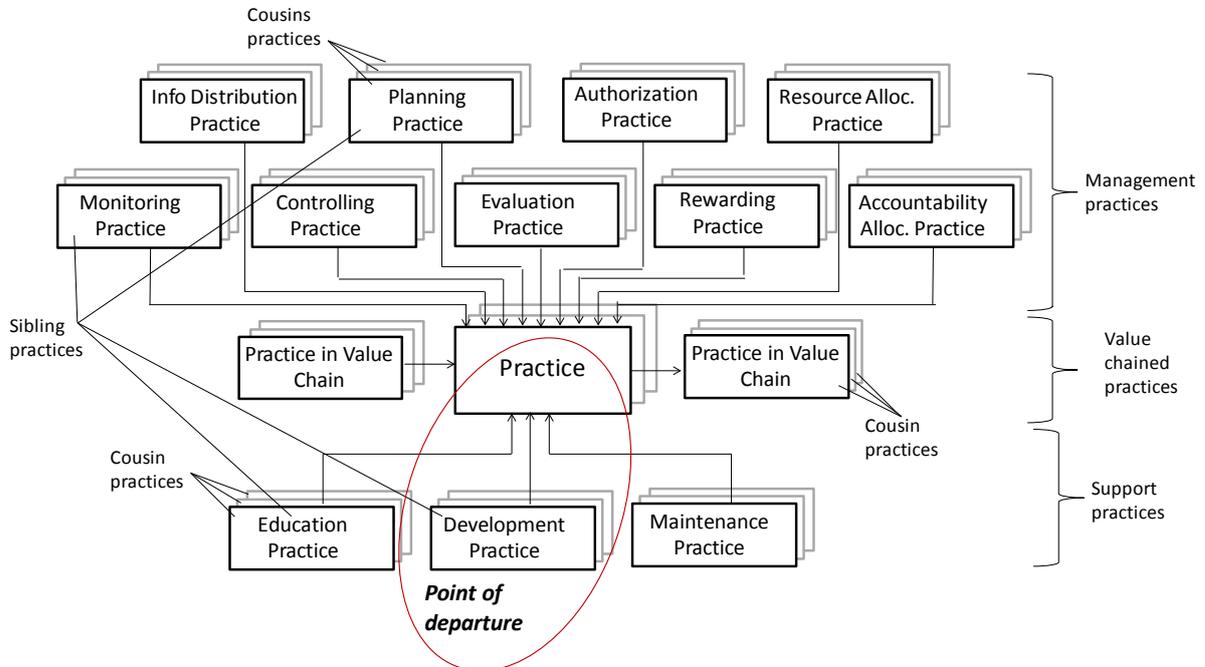


Figure 1. A conceptual model specifying how different types of relationships between practices.

The conceptual model in Figure 1 specifies that there exists related practices for a given practice (the given practice in Figure 1 is named “Practice”. As mentioned above, the relationships between the given practice and the related practices are of different types, such as management, support and value chain relationship practices.

In this paper, we take our point of departure in a development practices. In this practice, artefacts for a given practice is developed, see circle in Figure 1. The main idea in the paper is, however, that other related practices also need to be considered when developing an artefact for that given practice.

Development practices can be related to all existing practices in an organization since artefacts can be developed for all practices. For example, a development practice can be related a management practice for a given practice, such developing an artefact for a controlling practice (i.e. a management practice) controlling a car production practice in an organization. In this case, the development and controlling practice become the departure point, and the controlling practice is the given practice. This controlling

practice (i.e. the given practice) can have all other related practices, including management, support and value chain practices. Note that a controlling practice can also have a controlling practice related to it, aiming at controlling the controlling practice. The latter is still called a controlling practice since it is a controlling practice in relation to the car production practice.

In the rest of the chapter, the major concepts presented in the conceptual model in Figure 1 are defined and described.

3.1 Management relationships

One practice can manage another practice. In IDEF0 terms, this corresponds to the control channel, from top of a given practice. For example, a practice can *plan* activities to be carried out in another practice, or one practice can *monitor* the activities in another practice. Some management practices aim at improving or enabling another practice. For example, a health care planning practice could improve the efficiency of a health care delivery practice. However, a managing practice may also be detrimental to the practice it manages, and its *raison d'être* is then that it provides benefits to another practice or to the environment at large. For example, a governmental drug enforcement practice may contain the societal damages caused by a drug dealing practice.

Definition: A practice A *manages* a practice B if the goal of A is to manage processes or artifacts of B.

Definition: A *management practice* is a practice that manages another practice.

The following list identifies a number of management relationships among practices, based on Hamel and Breen (2007):

- **Resource allocation.** Actors are allocated to work activities.
- **Information distribution.** Information needed to carry out activities are distributed to the actors allocated to these activities.
- **Planning.** The activities of a process are planned and ordered.
- **Authorization.** The actors authorized to carry out an activity are specified.
- **Accountability allocation.** The actors accountable for an activity are specified.
- **Monitoring.** The execution of the process is monitored for problems and deviations from plan.
- **Controlling.** Actions are taken to address execution problems and plan deviations.
- **Evaluation.** Process performance and the quality of results are evaluated.
- **Rewarding.** Rewards are distributed based on excellence in performance.

3.2 Support relationships

One practice can support another practice in the sense that it produces or maintains resources used in that practice. In IDEF0 terms, this corresponds to the mechanism channel, coming from beneath a given perspective. For example, a dental training practice can educate future or present dentists for a dentist practice. Another example is a maintenance practice that repairs and maintains equipment in a production practice.

Definition: A practice A *supports* a practice B if the goal of A is to produce or maintain resources used in B

Definition: A *support practice* is a practice that supports another practice

The following list specifies three support relationships among practices:

- **Development.** Artifacts are developed for the use in another practice.
- **Maintenance.** Artifacts are maintained, for example machines are repaired.
- **Education.** People are trained and educated to acquire new skills and knowledge.

3.3 Value chain relationships

One practice can be related to another practice through a value chain relationship, e.g. an operations practice can produce output for an outbound logistic practice. These practice relationships are akin to the process relationships in the value chain model of Porter (1985). From an IDEF0 perspective, this corresponds to the input and output channels. A value chain is defined as a sequence of activities that are carried out in order to deliver valuable goods or services to customers.

Definition: A practice A is *chained* to a practice B if they belong to the same value chain.

Definition: A *value chained practice* is a practice that is chained to another practice.

3.4 Parasites, siblings and cousins

In order to identify practices that need to be taken into account in artifact development, it is helpful to introduce some additional practice relationships derived from those above. The first of these reflects existence dependency. Management practices and support practices share a common characteristic, namely that they are existence dependent upon another practice. In this respect, managing and supporting practices can be seen as parasitic upon other practices; they cannot exist without these practices.

Definition: Let A and B be practices. A is *parasitic* on B if A manages or supports B.

Definition: A *base practice* is a practice that is not parasitic on any other practice.

In other words, a base practice neither supports nor manages any other practice. For example, a car production practice is an example of a base practice.

Practices that are parasitic on the same practice often have interdependencies that require them to communicate and coordinate in order to function smoothly and effectively. Such interdependencies need to be taken into account in artifact development. We call such practices, sibling practices.

Definition: Two practices are *siblings* if they both are parasitic on the same practice.

Practices with similar goals often exhibit the same function and construction even if they are parasitic on different practices. Therefore, it can be helpful to be informed by such practices when developing artifacts. We call such practices, cousin practices.

Definition: Two practices are *cousins* if they have the same goal type and are parasitic on different practices.

Both management and support practices assist a practice. This can be done directly, as a controlling practice can assist a car production practice, which is a base practice). However, a management or support practice can also assist another management or support practice, which in turn, assist a base

practice. An example is a development practice developing an artifact for a controlling practice, which, in turn, controlling a car production practice, i.e. the base practice. In this case, the development practice assists the controlling practice directly and the car production practice indirectly.

Definition: A practice *assists* another practice if it supports or manages that practice, either directly or indirectly.

The development of an artifact for a special practice can also be informed by a more general practice, including theories and concepts common for more specialized practices. For example, a production practice is more general than a car production practice or a medical device production practice.

Definition: A practice A *generalizes* a practice B if the goal type of A is more general than that of B.

4 Five practice context guidelines

Based on the conceptual model from the previous section, five *practice context guidelines* are proposed that support designers in identifying those practices that are relevant for their artefact development. As the guidelines target designers, they all take their starting point in development practices. These practice context guidelines are not to be viewed as cookbook recipes; rather they are meant to spur a developer to reflect creatively about the context of the practice for which she designs an artefact.

Practice context guideline 1

Name: Siblings of the development practice.

Guideline: When developing an artifact in a development practice, the needs and characteristics of its sibling practices are to be taken into account.

Example: When developing a health care information system (i.e. an artefact developed in a development practice) for a health care prescription practice, sibling practices need be taken into account. One such practice is governmental controlling practice of prescriptions (i.e. a management practice). The goal of this governmental practice it is to lower the amount of unnecessary prescription of antibiotics. This can be done by forcing physicians and nurses to justify why they prescribe antibiotics to patients. Therefore, when developing an information system for a health care prescription practice, instruments or functions that force physicians and nurses to justify their prescription of antibiotics need to be part of the design of the health care information system to be developed, see Figure 2.

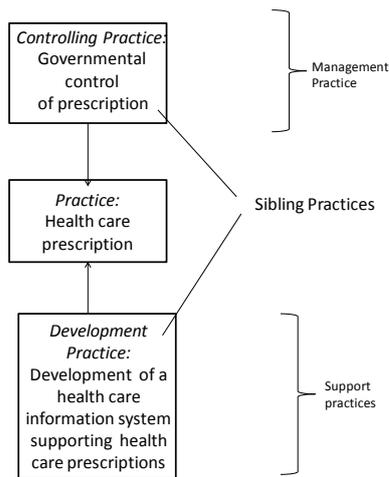


Figure 2: Example of guideline 1. When developing an information system in a development practice for a health care prescription practice, sibling practices to the development practice need to be considered, for example, a governmental controlling practice, as described in the example.

Practice context guideline 2

Name: Assisted practices

Guideline: When developing an artifact in a development practice, the needs and characteristics of its assisted practices are to be taken into account.

Example: Developing a method (i.e. an artefact) for evaluation of higher education is done in a development practice. All practices that this development practice assists need to be taken into account during the design of method. Practices that the development practice assists are, in this example: 1) the practice of evaluation of higher education (i.e. a management practice to the practice of higher education) and 2) the practice of higher education, see Figure 3.

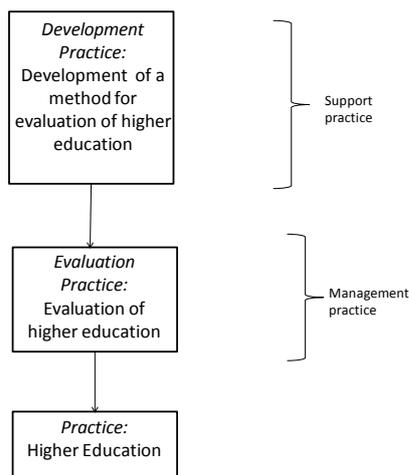


Figure 3: Example of guideline 2. When developing a method for evaluation of higher education in a development practice, all recursively assisted practices are to be taken into account, including the evaluation practice in which the method shall be used within, and the higher education practice, which will be evaluated by the evaluation practice.

Practice context guideline 3

Name: Cousin practices

Guideline: When an artifact is developed for a practice, the needs and characteristics of its cousin practices is to be taken into account.

Example: When developing a dashboard system with key performance indicators (i.e. an artefact developed in a development practice) for a car-repair practice, cousin practices to the car-repair practice need to be taken into account. For example, cousin practices are other vehicle-repair practices. These cousin practices can provide ideas of what to measure, and also provide benchmarking values that can be used, see Figure 4.

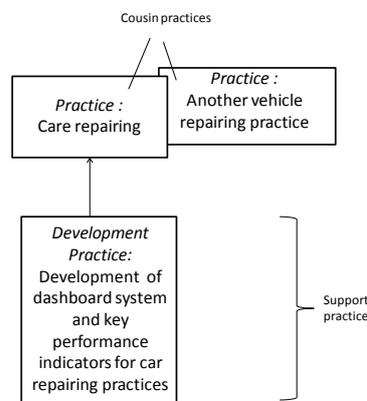


Figure 4: Example of guideline 3. When developing a dashboard system and key performance indicators for a car repairing practice, the cousin practices to the care repairing practice need to be considered.

Practice context guideline 4

Name: Generalized practices

Guideline: When an artifact is developed for a practice, the needs and characteristics of its generalized practices is to be taken into account

Example: When developing a business process model (i.e. an artefact developed in a development practice) for a sales practice for medical devices, the generalized practice for sales practices need to be taken into account. The generalized practice includes theories, concepts, and methods for sales, which may be useful when developing an efficient business process for the medical device sales practice, see Figure 5.

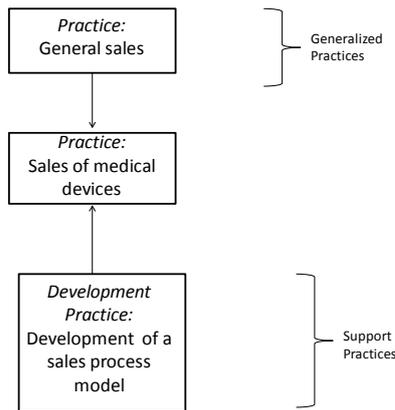


Figure 5: Example of guideline 4. When developing a sales process model to a sales of medical devices practice, a more general sales practice need to be considered, such as sales in general.

Practice context guideline 5

Name: Chained practices

Guideline: When an artifact is developed for a practice, the needs and characteristics of its chained practices are to be taken into account.

Example: When developing a newspaper packaging system (i.e. an artefact developed in a development practice) for a packaging practice, the chain practices to the packaging practice need to be taken into account. One chained practice of importance in this case is the distribution practice (i.e. a practice in the value chain) which will be impacted by the change of a packaging practice based on a new packaging system. Therefore, when developing a packaging system, the way of working in the distribution practice needs to be considered in the design of the artefact to be developed, see Figure 6.

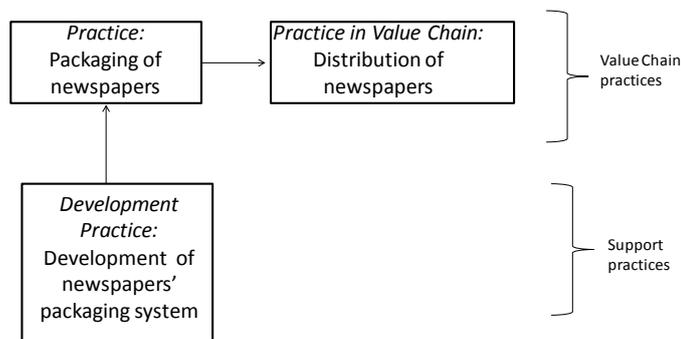


Figure 6: Example of guideline 4. When developing newspapers' packaging system for a newspaper packaging practices, practices in the value chain in which the packaging belongs, need to be consider, for example, the practice of distribution of newspaper.

5 Demonstration

In order to demonstrate the use of the proposed guidelines, they are applied to a case on documentation of best practices in health care. Important for a successful implementation of best practices in an

organization is to provide high quality documentation of the best practices. Therefore, in our research, we designed a set of guidelines for documenting BPs. Thus, the artefact was a set of best practice documentation (BPD) guidelines intended to be used in the practice of documenting BPs for health care. The development of BPD guidelines for health care was the point of departure in our research.

In order to reflect on the BPD guidelines and obtain suggestions for new ones, we applied the practice context guidelines, which are demonstrated below, see also Figure 7:

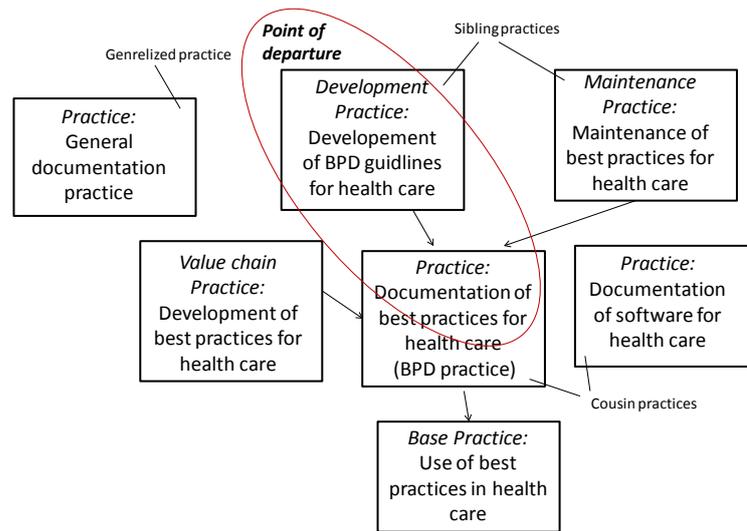


Figure 7. Relationships between the practices from the demonstration.

Practice context guideline 1. Siblings of the development practice.

In order to identify guidelines for the BPD practice (i.e. Documentation of best practices for health care in Figure 7), we investigated the sibling practices to the development practice, for example the maintenance practice of BPDs. A key activity in this maintenance practice is to handle versions of BPDs. Thus, we added the BPD guideline:

The BPD should specify information about revisions of the BP.

Practice context guideline 2. Assisted practices

In order to identify guidelines for the BPD practice, we investigated all assisted (i.e. managed or supported practices). One of these assisted practices is the practice of using BPs in health care (i.e. Use of best practices in health care in Figure 7. Typical quality criteria for BPs are here coherence and granularity (i.e. level of details). Thus, we added the BPD guidelines:

The BPD should specify the degree to which the BP constitutes a coherent unit, i.e. all parts are clearly related.

The BPD should specify the degree to which it is appropriately detailed.

Practice context guideline 3. Cousin practices

In order to identify guidelines for the BPD practice, we investigated its cousin practice of documenting software in health care. In this practice, it is common to document examples of implementations. Thus, we added the BPD guideline:

The BPD should specify a case where the BP is successfully implemented.

Practice context guideline 4: Generalized practices

In order to identify guidelines for the BPD practice, we investigated its generalized practice of documentation. For documentation in general, it is standard to include a title and a summary. Thus, we added the BPD guidelines:

The BPD should include a title outlining the BP.

The BPD should include a summary outlining the BP.

Practice context guideline 5: Chained practices

In order to identify guidelines for the BPD practice, we investigated its chained practices. One of these is the development of BP for health care, which provides input to the BPD practice. In this practice, it is common to discuss and record design rationale. Thus, we added the BPD guideline:

The BPD should specify the design rationale of the best practices

6 Concluding Remarks

Artefacts are to be used in practices, and artefact development therefore needs to take into account the needs and requirements of the stakeholders in these practices. But it is not sufficient to consider only the practices in which an artefact is to be used; also other related practices need to be taken into account. To address this issue, this paper has offered two contributions. First, a model for classifying relationships between practices has been proposed, distinguishing between managing, supporting, and value chain related practices. Second, a number of guidelines helping designers to identify those practices that are relevant for their artefact development.

A topic for future research is to identify additional types of practice relationships, including subtypes of the support, management and value chain relationships introduced so far. For value chain relationships, the kinds of relationships probably vary considerably depending on the domain. Another issue is to extend the relationships to artefacts, i.e. investigate what kind of relationships that exist among artefacts in different practices.

References:

- FIPS (1993) Integration definition for function modeling (IDEF0), Draft Federal Information Processing Standards, Publication 183 (Fips 183), available at:
www.idef.com/downloads/pdf/idef0.pdf
- Goldkuhl, G. (2011). The research practice of practice research: theorizing and situational inquiry. *Systems, Signs & Actions*, 5(1), 7-29.
- Hamel, G., Breen, B. (2007) *The Future of Management*. Harvard Business School
- Holmström, J., Ketokivi, M., & Hameri, A. P. (2009). Bridging practice and theory: a design science approach. *Decision Sciences*, 40(1), 65-87.
- Peffer, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. *Journal of management information systems*, 24(3), 45-77
- Porter, M. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York.: Simon and Schuster.