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Effects-Driven IT Improvement: Pursuing local post-implementation opportunities

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Abstract. Many opportunities for benefitting from information technology (IT) are not discovered until IT systems are in operational use. The realization of these benefits depends on local efforts that cannot presume top-management support but must themselves generate the innovation potential necessary to improve system use. To facilitate such local efforts, we propose effects-driven IT improvement. It consists of iteratively specifying, realizing, and evaluating the usage effects pursued with a system. We describe the effects-driven process and illustrate it with three real-world cases. On this basis, we discuss its contributions toward local benefits realization at the post-implementation stage. Our overarching contribution is to provide a means of operationalizing and packaging improvement initiatives in a manner that combines local and lightweight experimentation with the data-driven realization of meaningful effects. The three cases illustrate that the effects-driven process can reopen the window of opportunity for benefits realization, result in learning that calls for respecifying the pursued effect, and render evaluation data almost superfluous because the local actors are confident that the effect is substantial and real. In addition, local initiatives to improve system use may create the momentum, evaluation infrastructure, and benefits documentation necessary to pave the way for further improvements. However, these potentials come with challenges, which we also discuss.

Key words: benefits management, effects-driven process, effects realization, IT improvement, local entrepreneurs, local innovation, post-implementation stage.

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1   Introduction

To realize benefits from information technology (IT), the organizations that deploy an IT system must integrate it into their structures and processes. Some benefits are planned ahead (Einhorn et al., 2019; Hertzum, 2021; Ward & Daniel, 2012). They constitute the rationale for introducing the system and are pursued through the implementation efforts associated with go-live. Usually, management oversees the realization of these benefits and provides resources and impetus for the organizational changes involved in realizing them. Other benefits do not emerge until later (Karasti et al., 2010; Orlikowski, 1996; Simonsen & Hertzum, 2012). They arise as local opportunities and are pursued through bundling these opportunities with new ways of using the system. The realization of these benefits depends on local efforts that cannot command many resources but—over time—improve the use of the system. This article is about such later and local benefits realization.

In this article, we aim to extend existing research on benefits realization (e.g., Holgeid et al., 2021; Ward & Daniel, 2012) by shifting the focus from implementation to post-implementation and from a top-down approach to local initiatives. We pursue the research question: *How can benefits be pursued locally after IT systems have entered the post-implementation stage?*

At the post-implementation stage, the system vendor has typically left, because it has fulfilled its contractual obligations, and customer management has typically moved on to other projects, because the implementation of the system has progressed beyond its initial hectic phase. Therefore, the actors who pursue benefits at this stage are typically local users acting as entrepreneurs. To support these local entrepreneurs, we have devised a benefits-realization process for the post-implementation stage. In devising this process, we have responded to Hesselmann and Kunal's (2014) call for more applied research methods in benefits-realization studies. Concretely, we have devised the process—labelled effects-driven IT improvement (EDIT)—through a series of more than ten action-research studies conducted over the last decade. In these studies, we have facilitated local entrepreneurs in realizing additional benefit from their systems.

A benefits-realization process for the post-implementation stage is needed for four interrelated reasons. *First*, the work practices associated with a new system tend to congeal after a brief period of exploration. That is, the period during which an organization takes action to explore, modify, and adapt to a system and its use—the window of opportunity—is normally too brief to arrive at practices that realize the full potential of the system (Arvidsson et al., 2014; Jasperson et al., 2005; Tyre & Orlikowski, 1994). To realize the full potential, organizations must be able to pursue additional benefits when local windows of opportunity open at later points in time. *Second*, many oppor-

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tunities to derive additional benefit from a system emerge locally during continued use. They involve adapting the system to integrate it in more tasks and adapting local tasks to exploit more system affordances (Orlikowski, 1996). These adaptations were initially unanticipated. They happen during continued use because it makes the consequences of using the system salient to its users (Wagner & Newell, 2007), who react by adapting to them. This way, the system is bundled with new goals (Elbanna, 2010). To meet these goals, the users need a means of pursuing them in a local and effective manner. *Third*, IT systems, including enterprise resource planning (ERP) systems and electronic health records, have become increasingly configurable. Many system adaptations that previously required vendor intervention can now be made locally by super users or IT support staff in the organization that has deployed the system (Balka et al., 2005; Bygstad, 2017). That is, the possible scope of local benefits realization has increased. *Fourth*, many systems remain in operational use for years or even decades. To remain useful for such extended timeframes, the systems and their use must evolve (Karasti et al., 2010; Ribes & Finholt, 2009). While local benefits realization mostly results in small improvements, these improvements may over time accumulate into changes that are critical to sustaining the effectiveness of a system.

In the following, we describe, exemplify, and discuss EDIT. First, we describe EDIT by elaborating its steps and its iterative, effects-driven process for benefits realization (Section 2). Second, the application of EDIT is illustrated with three real-world examples of local projects conducted using EDIT (Section 3). Third, we discuss the contributions of EDIT toward realizing local benefit from IT systems during the post-implementation stage (Section 4).

2   Effects-driven IT improvement

In our experience, post-implementation IT improvement is often a local initiative that exploits a temporary window of opportunity, is conducted by local actors in a single department, enjoys little or no attention from top management, and makes do with available competences and IT-configuration opportunities. It extends the time-boxed and centrally governed investment in the initial implementation of IT systems with an open-ended, bottom-up entrepreneurial process. EDIT aims to support this entrepreneurial process by being simple, yet systematic and operational.

2.1   A local and pragmatic means to benefits realization

EDIT is a local means to realize additional benefit from IT systems that are already in operational use. The EDIT process consists of effects specification, effects realization, and effects evaluation (Figure 1). We originally devised EDIT to bridge the chasm between technical development and organizational implementation, see the appendix. Over the last decade, our focus has shifted to post-implementation benefits realization.
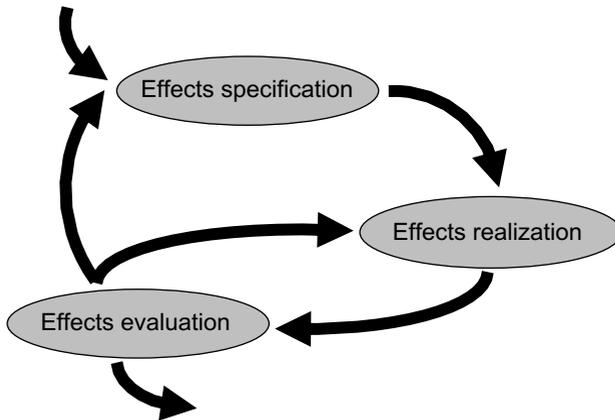

Figure 1. Effects-driven IT improvement, based on Hertzum and Simonsen (2011a)

The research on benefits realization focuses mainly on IT development and initial implementation but recognizes the need for continuing benefits realization at the post-implementation stage. For example, four recent literature reviews—analyzing a total of 140 articles—accentuate the need for more research on extending benefits-realization processes into the post-implementation stage. *First*, Hesselmann and Kunal (2014) note the low adoption rate of benefits-realization processes and the need for making them more applicable for practitioners. They find that guidelines on how to adopt such processes are "quite rare in the literature" (p.11) and call for the use of "more applied research methods, such as action research" (p. 12). *Second*, Holgeid et al. (2021) confirm that few organizations report implementing benefits realization as a continuous process throughout the IT lifecycle. In their review, they find "only one study to report findings on how the practice of doing post-project benefits identification can be associated with good benefits" (p. 11). *Third*, Osnes et al. (2018) find that change management is a major challenge during the post-implementation stage of ERP systems and conclude that change-management programs for the ERP post-implementation stage must "allow for local adaptations when necessary" (p. 547). *Fourth*, Ha and Ahn (2014) similarly argue

for continuous post-implementation improvement efforts because "the need for maintenance and support arises naturally after go-live" and because "on-going reengineering of the business processes is necessary" (p. 1066).

Wagner and Newell (2007) argue that users are most motivated to influence the design of a new system after it has entered into operational use because that is when the consequences of the system become salient to them. On that basis, "organizations should consider carefully how users may be encouraged to participate in the post-implementation environment" (Wagner & Newell, 2007, p. 518). At the same time, users have to divide their attention and resources between getting their daily work done and redesigning their work configuration to become able to work more effectively in the future. It often requires most of the users' attention and resources to meet their work-output targets (Arvidsson et al., 2014; Tyre & Orlikowski, 1994). Effects specification provides a means for local users to ponder and prioritize which change initiatives to pursue. Subsequently, effects realization is about accomplishing meaningful change with limited resources. It cannot presume top-management support but must, itself, generate the innovation potential necessary to create, sustain, and—possibly—scale up change (Arvidsson & Mønsted, 2018). Effects evaluation provides input that feeds back into the ongoing improvement process but also informs its possible larger-scale diffusion by documenting the ensuing benefit. In total, EDIT is a pragmatic means to pursue change in that it is:

- *Local*: To remain practicable, improvement initiatives should arise from local entrepreneurs who are knowledgeable about the work. Windows of opportunity often appear when such entrepreneurs encounter problems or seize opportunities related to an IT-supported process.

- *Lightweight*: It should be feasible to pursue small opportunities as well as larger ones. Often, the only resources available will be local and the window of opportunity may be brief.

- *Data-driven*: Evaluation data provide information about the status of effects realization and a platform for decisions about what to do next. The data may be quantitative, qualitative, or both.

- *Exemplary*: By starting small, experiences from the first case contribute insights and, if the case was successful, momentum for proceeding to other cases. This is crucial to the bottom-up generation of improvements and innovation potential.

- *Meaningful*: The users and other stakeholders who need to invest work and resources in attaining an effect should experience the effect as desirable. Unless the effect makes sense to those involved, they may merely provide token support for it.

We contend that these principles make EDIT suited for many post-implementation IT improvement efforts, but not for all. Table 1 lists questions to consider in deciding whether EDIT is suited for the situation at hand.

Questions to consider
• Have critical errors been encountered or inferior workarounds emerged?   • Are there innovative ideas, new needs, or emergent opportunities that are worth pursuing?   • Are these ideas, needs, or opportunities in alignment with organizational plans and strategies?   • Can they be realized by reconfiguring IT systems and adapting work practices?   • Is a window of opportunity opening with the resources and time to realize and evaluate wished-for effects?   • Are local entrepreneurs interested in working systematically with IT improvement?   • Does local management accept, understand, and welcome the initiative?   • Can the initiative be done locally or is it dependent on non-local authorization/ coordination?   • Does the local improvement initiative have a potential for scaling and wider dissemination?

Table 1. Questions to consider in deciding whether to apply effects-driven IT improvement

2.2   Effects specification

Effects specification serves to single out improvement opportunities that are sufficiently beneficial to be worth pursuing. Some improvements are attractive because the effect is easy to realize, others because it is substantial in magnitude or importance. Most fall somewhere in between these poles. However, many desirable effects are rendered invisible by rigid procedures, incompatible IT systems, insufficient competence in reconfiguring them, established but suboptimal work practices, and the users' primary focus on getting their daily work done (Arvidsson et al., 2014; Huysman et al., 2003). Under such circumstances, possibilities for improvement lie dormant until a window of

opportunity arises. This may be the case, for example, when unacceptable errors occur or when local entrepreneurs conceive new ways of working.

It has three qualities to specify the intended improvement in terms of an effect. *First*, the effect emphasizes the end to which the improvement initiative is the means. For example, the effect may specify reduced time spent on a task, lower workload completing it, fewer errors in the task process, higher quality of task outcomes, better user satisfaction or customer experience, and the like. This way, effects are stated in work-related terms, which makes it easy for users to relate to them (Hertzum & Simonsen, 2011a). *Second*, the specification of an effect is an occasion for gauging the support it enjoys among the actors who have a stake in realizing it. If key actors are not buying in to the effect, then it is futile to proceed to effects realization (Hertzum & Simonsen, 2020). Instead, entrepreneurs need to invest additional effort in pitching the effect to create buy-in and open a window of opportunity. In cases with multiple candidate effects, prioritization is one way of gauging support. *Third*, a specified and prioritized effect focuses the improvement process by stating the pursued end goal of its iterations. While the means employed to obtain the effect may change during the process, the effect provides a sustained focus. To be able to assess the progress made toward attaining the effect, it must be sufficiently concrete to be measurable. In specifying a measurable effect, concrete effects can sometimes stand in for abstract ones. For example, Simonsen, Karasti, et al. (2020) sought to optimize the coordination of surgeries at a hospital. They specified the effect of reducing the patients' fasting time because such a reduction was measurable and could only be attained by optimizing the coordination of the surgeries.

Individual improvement initiatives may be scoped by the actors involved in the initiative. They normally specify a single effect and then proceed to effects realization (e.g., Simonsen, Malik, et al., 2020). However, multiple effects may also be brainstormed, specified, and prioritized at workshops intended to spawn improvement initiatives (e.g., Hertzum & Simonsen, 2019). At such workshops, management, key stakeholders, and users discuss bottlenecks in local practices, improvement opportunities afforded by existing IT systems, and effects that appear attractive and feasible to realize. For each effect, the workshops result in a specification that describes the effect, the stakeholders, the present level of performance, the target level to attain, and the known barriers to attaining it. On this basis, project teams can be formed to pursue the prioritized effects. Table 2 lists questions to consider during effects specification.

Questions to consider
• Are the effects easy to understand and communicate (a clear business case)?
• Is the effect related to overall tasks or processes? If so, should we specify sub effects?
• Have the effects been prioritized?
• Have the key stakeholders and other actors committed to pursue the prioritized effects?
• Are the effects sufficiently concrete to be measurable?
• How will the effects be measured? Are evaluation data easy to obtain?
• How do we document the effects that are abstract or hard to quantify?
• Is a baseline measurement necessary and feasible?
• Do we have adequate resources (competences and person hours) for the project team?

Table 2. Questions to consider during effects specification

2.3   Effects realization

Effects realization comprises the interventions performed to change the existing situation into one that makes the wished-for effect real. While the effect specifies what this situation should look like, it may not be obvious how to bring it about. A project team must devise and execute the necessary interventions. One class of interventions revises organizational procedures to meet new goals or exploit existing technological possibilities. Another class reconfigures IT systems to serve additional purposes or fit better to existing practices. These interventions provide the basis for change. A third class of interventions targets the adoption of the revised procedures and reconfigured system facilities. These interventions use informational, motivational, and authoritarian means to get the users on board.

Because most post-implementation improvement initiatives are local, adoption is rarely mandated by top management but must be earned. Thus, it is important that the project team comes to understand the reasons for some users to hesitate to adopt and that it addresses these reasons in its interventions. The reasons why users may hesitate to adopt include (Hertzum, 2021; Hertzum & Simonsen, 2020):

- *Lack of urgency*, which is the sense that there is no need for the change (Kotter, 2008). In the absence of an experienced need, people will tend to see the improvement initiative as effortful and superfluous rather than engaging and rewarding. This reason is especially common for effects that rely on contributions from multiple user groups. It indicates that some users have not bought in to the pursued effect.

- *Risk aversion*, which ensues when users perceive that running a risk will have a low probability of paying off (Holt & Laury, 2002). Risk-averse users may buy in to the effect but they consider it unlikely that it can be realized. Therefore, the effort of trying is not justified. To counter risk aversion, the project team needs early successes, which generate momentum by showing that the risk is surmountable and the gain valid.

- *Change fatigue*, which results from experiencing a continual stream of improvement initiatives but failing to see the final purpose or connecting logic (Garside, 2004). Thus, improvement initiatives need to be coordinated to align the specified effects with one another and to prune the number of initiatives. In addition, the project team should avoid poorly communicated effects and poorly executed interventions, both of which fuel change fatigue.

- *Going solid*, which is the absence of resource buffers for improvement initiatives because all resources are committed to tasks that are necessary for the organization to function at its current level of production (Cook & Rasmussen, 2005). If key users experience that meeting their work-output targets consumes all their resources, then the project team will need to abandon effects realization or convince management to allocate additional resources.

To address these barriers toward adopting new ways of working, the project team must engage in the complexities of organizational structures and processes. In doing so, interventions are revised and effects realization essentially becomes a learning process. Evaluation activities are central to this learning process (Bossen et al., 2016). Data from observing or talking with users provide insights into their experience of the new ways of working and any barriers to adoption. In addition, data for the subsequent effects evaluation must be collected. Reports drawn from the IT system provide easy access to data about the status of many effects (e.g., Berger, 2014). Other effects require that

measurements are conducted to collect the necessary evaluation data (e.g., Hertzum & Simonsen, 2016). While the activities for collecting evaluation data are defined during effects specification, they are performed during effects realization. Table 3 lists questions to consider during effects realization.

Questions to consider
• What interventions (i.e., adaptations of IT and work practices) may produce the pursued effect?
• Are the interventions carried out as intended?
• Do we understand the impact and potential deficiencies of the interventions?
• Are some users concerned about the interventions or pursued effect?
• Do the involved users have the motivation and time to participate?
• May risk aversion challenge effects realization?
• Do we react quickly on emergent adverse effects to limit the damage they may cause?
• Are the necessary evaluation data captured and stored?
• When have we collected a sufficient amount of evaluation data?

Table 3. Questions to consider during effects realization

2.4 Effects evaluation

It cannot be presumed that once an effect has been specified, its realization will ensue. Effects evaluation is necessary to learn whether the interventions are effective and to sustain the focus on the effect during the iterations following ineffective interventions. However, the evaluation should not only provide data about whether or not the effect has been attained. In situations where it has not been attained, the evaluation should also provide input about the reasons why the interventions have been ineffective (Ward & Daniel, 2012). Typically, the data about whether the effect has been attained will be quantitative to be able to set clear target criteria, whereas data about the reasons will be qualitative to inform the interpretation and discussion of the status of the improvement initiative.

A central activity in the effects evaluation is a meeting where the evaluation results are presented and discussed with key stakeholders. In preparing this meeting, the project team cleans the evaluation data and analyzes them for trends. The cleaning is important to ensure the quality of the data and requires thorough knowledge of the work context and interventions to spot spurious data (Hertzum & Simonsen, 2019).

The outcome of the meeting is a decision about what to do next. There are four possible decisions about what to do next:

- *Effect attained*: If the evaluation shows that the effect has been attained, then the process has come to its end. Sometimes, effects are attained immediately after an intervention but, then, gradually wear off (Granlien & Hertzum, 2009). Therefore, effects evaluation should continue for some time after the end of the interventions before it is concluded that the new ways of working have been incorporated in the structures and processes of the organization.

- *Renewed effects realization*: If the effect has not been attained but is still deemed desirable and realizable, then new interventions are necessary. Iterations back to effects realization are frequent, for example if the interventions are insufficiently introduced, or because unanticipated challenges or adverse side effects have thwarted the improvement. To attain the effect, the interventions may for example need to revisit the configuration of the system, to target adoption issues, or to obtain additional resources.

- *Reopen effects specification*: The pursuit of the specified effect may lead to the conclusion that it is misconceived or to the emergence of an alternative, more desirable effect. If so, effects specification must be reopened to revise the pursued effect (e.g., Brandrup et al., 2017). Such revision is an explicit indication that local learning has occurred about what improvements to pursue, not simply about how to pursue previously specified effects.

- *Closed window of opportunity*: Some improvement efforts are discontinued without attaining the pursued effect (e.g., Hertzum & Simonsen, 2020). It may turn out to be unrealistic to succeed, the actors may run out of steam, or local priorities may shift to other initiatives. In addition, the window of opportunity can close as a result of external events, such as changes in the IT infrastructure, organizational reconfigurations, or the replacement of key participants.

The first step in the effects evaluation is often a baseline measurement before effects realization. A baseline provides data about the pre-improvement status and informs discussions about how ambitious a target level to set for the effect. The last step in the effects evaluation may be to consider whether a locally attained effect can and should be scaled up. If the IT improvement is also attractive to other organizational units,

they might be interested in learning about the interventions and results. Measurements showing that the effect has been attained provide a convincing argument that the improvement is realizable and the interventions effective (e.g., Berger, 2014). This way, local initiatives to optimize IT use may open windows of opportunity for improvements in other organizational units. Table 4 lists questions to consider during effects evaluation.

Questions to consider
• Are the necessary evaluation data available in sufficient amounts?
• Have the evaluation data been cleaned to bolster their quality?
• Who should participate in the evaluation meeting?
• Do we understand the background for any spikes and curious deviations in the data?
• What key trends and learning points can be gleaned from the data?
• How should the data be visualized and presented?
• What parts of the intervention worked well and not so well?
• Was the effect achieved? If not, what is the next step?
• If the effect was achieved, should it be disseminated to other organizational units?

Table 4. Questions to consider during effects evaluation

3   Three real-world cases

The EDIT process has been developed through a series of real-world cases. In this decade-long course of events, the EDIT process and the cases have mutually influenced each other. The cases have contributed lessons that have been aggregated into EDIT, which in turn has contributed a described process that has been tried out in the cases. In the following, we describe three of the cases. They illustrate in real-world detail how local actors use EDIT to derive benefit from existing systems. Table 5 provides an up-front summary of the three cases. Instructively, the EDIT processes in the cases vary with the local context. This variation includes differences in whether the starting point is renewed effects realization or a newly emerged goal, differences in whether the main focus is on specification, realization, or evaluation, and differences in whether the process outcome is a well-documented effect, an unattained effect, or few evaluation data but much confidence in the new way of working.

	Digital Post	*Electronic whiteboard*	*Epic*
Specified effect	To reduce postal costs by sending electronic mail rather than physical letters	To reduce interruptions when transferring patients to the operating ward	To reduce the time from receiving to approving a patient referral
Intention	Reopening the window of opportunity, i.e., renewed effects realization	Bundle existing system with new goal, i.e., exploit dormant opportunity	Bundle existing system with new goal, i.e., exploit dormant opportunity
Interven-tion	Individual-practice forms, system reconfigurations, metrics for all staff, and end-of-day meetings	None—the baseline measurements overturned the specified effect	Task reallocation supported by new procedures and individualized training
Evaluation data	Number of physical letters—extracted from system	Ratings—collected with experience-sampling app	Start and end times of task—extracted from system
Outcome	Effect attained—weekly measurements key to attain and document it	Effect not attained—return to effects specification	Effect attained—few data but much confidence in the new ways of working

Table 5. Summary of the three cases

3.1 Digital Post: realizing cost savings two years after adoption

Digital Post is an e-government system that provides a secure and standardized means of electronic communication between citizens and municipalities. It is essentially a specialized email system. The system was implemented in all Danish municipalities in 2010-2014 (Berger & Hertzum, 2014) and is still in nationwide use today. The business case for Digital Post was the saving of about DKK 5 in postal costs every time a municipality sent an electronic mail to a citizen in place of a physical letter. Assens, a municipality with 41000 citizens, adopted Digital Post in 2010 but saw no reduction in postal costs for the first two years. Thus, municipal management decided to conduct an

effects-driven project in the Citizen Service Center to realize benefit from Digital Post (Berger, 2014). The project ran in March-September 2013.

Due to the cost savings expected from Digital Post, Assens had DKK 0.8 million cut from its state funding in 2013. This cut, which would continue in the following years, created an impetus for local management to achieve cost savings from Digital Post. Thus, the effect specified for the project was to reduce postal costs, as stated in the business case. Data for measuring this effect were readily available in the municipal accounts and could be extracted on a weekly basis to gauge how the postal costs evolved over time. While the specification and measurement of the effect were straightforward, its realization was not. After two years of non-use, a strong intervention was needed to reopen the window of opportunity for benefitting from Digital Post.

A variety of activities were conducted to reach and influence all staff. They spanned reconfigurations of Digital Post to improve the fit with local practices as well as work-practice changes to make increased use of the system. The activities were planned in collaboration with the head of the Citizen Service Center and involved preparations, intervention, and follow-up.

Preparations: To target their general attitude to systems such as Digital Post, the staff members received a survey about their e-government readiness. This survey showed considerable skepticism and revealed a need for demonstrating, rather than presuming, that the system would not deteriorate the service provided to citizens. Several meetings and focus groups were conducted to motivate the project and get to know the staff and their concerns. A one-page guide to Digital Post was also produced. It consisted of a few annotated screenshots and replaced the vendor's 40-page manual.

Intervention: To create momentum, the intervention consisted of one week of intense activity in early May. Throughout this week, one of the entrepreneurs was present in the center to support the staff in using Digital Post, learn about barriers to its use, and act on these barriers. The actions for example involved communicating barriers to the municipal IT support and having them adjust the configuration of Digital Post. Each day, each staff member was provided with a paper form for recording the type and frequency of the physical letters they sent. This form served as (1) a vehicle for individual reflection on the reasons for sending physical letters, (2) a starting point for conversations about barriers against using Digital Post, and (3) an encouragement to switch to Digital Post. To strengthen the encouragement function, the form was present on the staff members' desks and thus disclosed their non-use of Digital Post to their colleagues. At the end of each day, metrics were extracted about the number of electronic and physical letters sent by the center staff. These metrics were posted in the center and formed the input for an end-of-day discussion.

Follow-up: To maintain momentum and remove additional barriers, three follow-up reports were produced in the period from May to September. They provided statistics about effects realization, recommendations for additional activities, and a list of outstanding barriers. The statistics showed that the number of physical letters dropped from an average of 1289 a month in March and April to an average of 733 a month in May to September. In contrast, the number of digital posts rose from 8 in March to about 1000 a month. Figure 2 shows the resulting reduction in postal costs from DKK 1925 a week (March and April) to DKK 1264 a week (May to September), a 34% decrease. The extended duration of the decrease showed that the use of Digital Post had become integrated in work practices. This result led the municipality to adopt the effects-driven process as a model for disseminating similar benefits from Digital Post to its other 30 administrative centers.
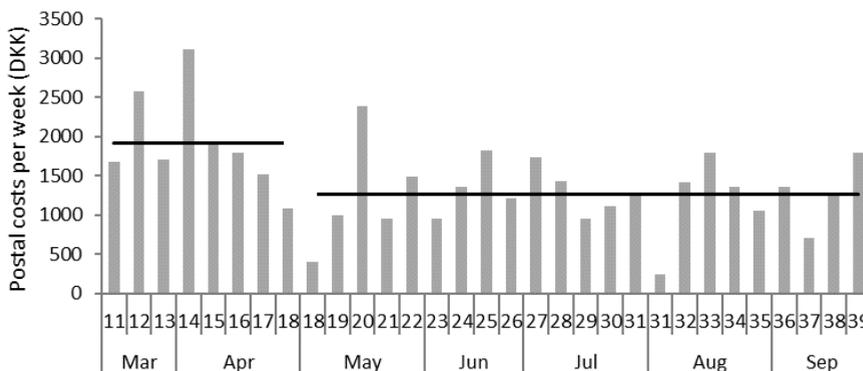

Figure 2. Weekly postal costs for March-September, 2013, in the Citizen Service Center in Assens, based on Berger (2014). The horizontal lines show the weekly average before (DKK 1925) and after (DKK 1264) the intervention.

3.2 Electronic whiteboard: aligning assumptions with workplace realities

In 2012, a regional, 250-bed hospital in Denmark replaced its dry-erase whiteboards with electronic whiteboards. While the installation of the whiteboard hardware was decided by hospital management, it was left to the departments to derive benefit from this new resource (Torkilsheyggi & Hertzum, 2017). The whiteboard had functionality for supporting intra- and interdepartmental coordination. Initiatives to support intra-

departmental coordination were most frequent, because they could be agreed by the individual department and, thus, were easier to accomplish. However, the interdepartmental uses of the whiteboard were among the most valued, because they supported more complex coordination tasks. The hospital director encouraged local projects that would reconfigure the electronic whiteboards and adapt work practices to improve interdepartmental coordination. Three surgical departments agreed to conduct a project about the interdepartmental coordination involved in the transfer of surgical patients from the inpatient wards to the operating ward (Brandrup et al., 2017). This project ran from September 2014 to December 2015.

The project originated from four effects-specification workshops. At these workshops, a total of 31 clinicians from across the hospital specified effects for deriving benefit from the whiteboards. In the course of the four workshops, the effects were specified in increasing detail. At the last workshop, they were prioritized. One of the prioritized effects was to reduce the number of phone calls among the clinicians when patients were transferred from one department to another. The two main reasons for prioritizing this effect were that (1) phone calls were a major source of interruptions and (2) the whiteboard appeared a more efficient way of conveying the information necessary to coordinate the transfers. The workshop participants believed that many phone calls concerned information that was already available on the whiteboards or could become available on the whiteboards, if they were suitably configured.

A project team was assembled to realize the effect of fewer interruptions during the transfer of surgical patients to the operating ward. To support this patient transfer, the whiteboards contained a field known as the boarding pass. The boarding pass contained a check-off item for each of the seven activities to be performed at the inpatient ward in preparing a patient for surgery. As an example, one of the items read "The patient has been fasting for six hours". When all seven items had been checked off, the patient was ready for transfer to the operating ward. Until then, the boarding pass provided an at-a-glance overview of why the patient was not yet ready for transfer. Thus, attending to the whiteboard provided a lot of the information that would otherwise require phone calls.

To assess the number of phone calls, an experience-sampling app was developed and installed on the phones used by the coordinating nurses at the operating ward. Whenever the coordinating nurses ended a phone call, the app would ask them to categorize the call as:

- an interruption that could have been avoided by using the whiteboard,

- an interruption that was unrelated to the whiteboard, or

- not an interruption.

The app also asked the coordinating nurses to categorize the caller by department. The answers to these two questions resulted in three insights that contradicted the specified effect. *First*, the coordinating nurses gradually realized that a phone call could be clinically well-motivated and still constitute an interruption. This realization led to an increase in the number of phone calls categorized as interruptions from the first to second measurement period, see Table 6. However, it also weakened the first of the two reasons for pursuing the effect of reducing the number of phone calls. *Second*, the coordinating nurses experienced that few phone calls could have been avoided by using the whiteboard, see Table 6. This finding showed that the second reason for pursuing the effect did not match the workplace realities. *Third*, 48% of the phone calls were within the operating ward. These phone calls were not about the transfer of patients from the inpatient wards—and thus not about the pursued effect—but instead about coordination issues internal to the operating ward.

Category	First measurement period (7 days, 1 coordinating nurse)		Second measurement period (16 days, 2 coordinating nurses)	
Interruptions				
Whiteboard-related	5	4%	42	7%
Whiteboard-unrelated	27	20%	361	57%
Not interruptions	102	76%	49	8%
Not categorized	0	0%	185	29%
Total phone calls	134	100%	637	100%

Table 6. Breakdown of phone calls onto interruption categories. The measurements include all phone calls to or from the coordinating nurse at the operating ward.

In this project, the effects evaluation became the major activity because the baseline measurements produced insights that overturned the specified effect. Further efforts to realize it were discontinued. Instead, it was learned that the most promising way of reducing interruptions from phone calls probably was to reduce phone calls internal to the operating ward. A main reason for these phone calls was that the operations required sterile conditions, which restricted the clinicians' possibilities for obtaining information by moving around in the ward.

3.3 Epic: improving the referral process through task reallocation

Two Danish healthcare regions implemented the electronic health record from Epic in 2016-2017. The implementation was a major effort that introduced new ways of working for thousands of clinicians. While the implementation of Epic was managed in a top-down manner, Epic also provided in-demand possibilities for subsequent local initiatives to improve work practices. At the Digestive Disease Center, Bispebjerg Hospital, the preadmission assessment of referrals became the focus of one such initiative. The center had recently been staffed with a nurse specialized in IT who together with the quality responsible chief physician and the executive chief physician initiated a local project to improve the referral process through task reallocation (Simonsen, Malik, et al., 2020). The task reallocation was conducted without IT reconfiguration, but Epic provided ready access to evaluation data. The project ran from August to December 2018.

The effect pursued in the project was to reduce the time for processing referrals. The first step in realizing this effect was to analyze the existing workflow, which involved tasks for medical secretaries and physicians. Patients' general practitioners sent referrals electronically to the hospital, which received them centrally and initiated them in Epic. Then, the referrals were forwarded to the departments, including the Digestive Disease Center. At the center, the medical secretaries received the referrals, passed them on to physicians for assessment, received them back, notified the general practitioner, and emailed an appointment to the patient. This process often took several days. It caused high workload for the secretaries because the secretary receiving a referral would typically not be the same as the one who finalized it. It was also an interruption for the physicians, who were often in the operating theatre or on their ward rounds. Furthermore, the analysis revealed that many referrals did not require a thorough clinical assessment but could be processed solely by the medical secretaries, for example in cases where the

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patients had to visit their general practitioner for additional tests before the referral could be made.

The analysis showed that the workflow could be optimized by having the medical secretaries process most of the referrals without consulting the physicians. Initially, this task reallocation raised concerns among the medical secretaries, who partly foresaw increased workload and partly feared not being sufficiently qualified. To meet these concerns, two sub effects were specified. First, the task reallocation should reduce the medical secretaries' work by making the processing of referrals a one-step process as opposed to the multiple steps of exchanging the referral among a physician and several secretaries. Second, the medical secretaries should, on a when-needed basis, hand over complex cases to the chief physician. Measuring the number of handovers would provide an indication of how often the secretaries did not feel qualified to process the referrals.

As a first intervention, the physicians and medical secretaries agreed to try out the new workflow for referrals concerning three relatively simple diagnoses (gallbladder stones, inguinal hernia, and umbilical hernias). These diagnoses represented 32% of the referrals received by the Digestive Disease Center in 2018. The new workflow took effect in November 2018. It was supported by Epic as well as by new procedures. The new procedures included a decision framework for the referrals processed by the medical secretaries alone and for those handed over to the chief physician. In addition, the medical secretaries received individualized training in the referral-related Epic facilities and were allocated an Epic supporter who was familiar with the task reallocation. No technical reconfiguration of Epic was needed.

The effects evaluation involved observation of the medical secretaries and data extracted from Epic. It was observed that the medical secretaries handed over fairly few cases to the chief physician. Approximately 90% of the referrals received during the observations were processed in one step by one medical secretary. On this basis, the secretaries concluded that the two sub effects were attained and that their concerns had been handled satisfactorily. The observations also showed that the Digestive Disease Center attained the main effect of reducing the time for processing referrals. Further support for this reduction was obtained by extracting a small sample of cases from Epic. These sample data showed a reduction in referral processing times from days to hours, see Table 7. The substantial magnitude of the reduction and the absence of problems with the new workflow made the task reallocation a win-win situation that did not call for further evaluation data. Rather, the results were taken as proof of concept. The center made the new workflow permanent and started to prepare a similar task realloca-

tion for more complicated diagnoses. In addition, the project was described in regional newsletters to inspire wider dissemination.

	Old work practice (August-October 2018)	*Improved work practice (November 2018)*
Number of referrals in sample	7 (of 228)	5 (of 69)
Average referral-processing time	1d 23h 47m	6h 56m
Range	1h 28m to 3d 18h 41m	23m to 16h 49m

Table 7. Processing times for a sample of the referrals received by the Digestive Disease Center.

4   Discussion

Effects-driven IT improvement aims to provide local actors with an instrument for realizing additional benefit from their IT systems during the post-implementation stage. In the preceding sections, we have responded to Hesselmann and Kunal's (2014) call for more applied research on benefits realization by contributing a process model (Figure 1), pragmatic principles (Section 2.1), guiding questions (Tables 1-4), and empirical cases (Section 3). In the following, we discuss the promises and challenges involved in working with effects in local initiatives to improve IT use. Thereafter, we discuss the possibilities for such local initiatives to pave the way for the wider dissemination of IT improvements.

4.1   Promises and challenges in effects-driven IT improvement

EDIT supports the adaptation and utilization of IT systems by facilitating local entrepreneurs in pursuing improvement opportunities with the resources available to them at the post-implementation stage. To summarize, we consider two aspects of working with effects important to IT improvement:

- EDIT provides a means of packaging improvement initiatives. In particular, the effects-driven process has proven an easy-to-understand scaffold for the often complex task of devising interventions that realize the desired change. With its iterative process, EDIT creates a recurring decision point for evaluating the progress and effectiveness of the interventions and deciding what to do next. For example, the weekly measurements were key to reopening the window of opportunity in the Digital Post case and the low number of phone calls rated as interruptions was key to returning to effects specification in the electronic whiteboard case.

- The pragmatic approach combines local and lightweight experimentation with the data-driven realization of meaningful effects. With this combination, EDIT contends that it pays off to spend scarce local resources on making improvement efforts data-driven. IT systems provide still better possibilities for extracting evaluation data at low cost, as illustrated by the Digital Post and Epic cases. By objectifying the result of interventions, evaluation data facilitate learning and inform discussions about the direction of future experimentation. The electronic whiteboard case shows that data may even lead to the abandonment of effects.

We consider these two aspects of working with effects promising, but there are also challenges in specifying, realizing, and evaluating effects in the context of IT improvement initiatives. The three cases illustrate the challenges as well as situated solutions. In the following, we discuss five challenges that stand out:

- Local users must be able to identify and articulate effects that encapsulate beneficial changes.

- Effects realization extends the change process by adding the activity of collecting evaluation data.

- Evaluation data should both quantify the effect and support learning about why the effect has, or has not, been attained.

- Local improvement initiatives need to be aligned with organization-wide plans and strategies.

- It may be asked whether EDIT favors some kinds of improvement.

First, effects specification assumes that local users are able to identify and articulate effects that encapsulate beneficial changes. To be able to do so, the users must understand their current practices and the possibilities for revising procedures and reconfiguring IT systems. If such an understanding is not present, it must be created before effects specification, for example using participatory design (Bødker et al., 2004) or contextual design (Beyer & Holtzblatt, 1998). In the three cases, it was present. Thus, the effect was adopted from the business case (Digital Post), specified at workshops prior to the project (electronic whiteboard), and formulated by the project team (Epic). Specifying an effect involves both articulating what it is about and devising how to measure it. Unless the effect and its measure align, EDIT will not facilitate the realization of the pursued effect. We have not experienced misalignment, but we have experienced that otherwise desirable effects were prioritized lowly because they were cumbersome to measure. Furthermore, the interventions to realize an effect involve increased attention to whether work is performed in an optimal manner. They may reveal negative side effects, which need to be avoided, or positive emergent effects, which should be exploited (Hertzum & Simonsen, 2011a; Orlikowski, 1996). In both situations, the effect should be respecified to align it with the new understanding of how best to improve the work practices.

Second, effects realization involves performing the change process and collecting evaluation data. Collecting evaluation data is an additional activity on top of the interventions enabling the change, and it is an activity that may require specific resources and competences. While the Digital Post and Epic cases show that evaluation data may be readily available from the system, the electronic whiteboard case exemplifies the building of an evaluation infrastructure for collecting the data. By integrating this infrastructure in work systems, relevant work events can trigger the data collection. This experience-sampling approach bolsters the quality of the data by collecting them in situ, at the moment, and without requiring that the user remembers to initiate the data collection (Chen, 2006). In the electronic whiteboard case, the data-collection app was integrated in the coordinating nurse's phone and collected data about the number of calls as well as the coordinating nurse's experience of whether the calls constituted an interruption. However, the resources required to build an evaluation infrastructure may be prohibitive. Furthermore, getting today's work done may take priority over filling out even a brief form, whether electronic or paper-based (Brandrup et al., 2017). If it is instead possible to extract evaluation data from the system, then this option is both nonintrusive and saves user resources. In accordance with EDIT being a lightweight process, easy access to evaluation data is an important consideration. It bolsters the quality of the data by ensuring that they get collected.

Third, effects evaluation is about whether and why an effect has, or has not, been attained. Sometimes, data about whether an effect has been attained are almost super-fluous because the local actors are confident that the effect is substantial and real. For example, few data were sufficient to confirm the local actors' belief in the new way of working in the Epic case. However, the electronic whiteboard case shows that data may contradict the actors' beliefs and, thereby, be an essential source of learning. Data about why an effect has, or has not, been attained are always important when it has not been attained—to help decide what to do next. When the effect has been attained, quali-tative data about why are possibly important because they may reveal unanticipated conditions or positive side effects that should be recognized in sustaining the effect. An exclusive focus on collecting quantitative data risks reducing the evaluation to merely ascertaining whether the effect has been attained. The Digital Post case illustrates how quantitative evaluation data can be complemented with efforts to discover and learn about barriers to effects realization. Conversely, an exclusive focus on qualitative data risks ridding the evaluation of the completion criteria—such as effect target levels—necessary to drive the iterative EDIT process. The completion criteria must be locally meaningful; otherwise, the users will not buy in to the effect (Simonsen et al., 2018).

Fourth, local improvement initiatives exist in the context of organization-wide plans and strategies that constrain local agency. Specifically, the organizational implementa-tion of a system includes the top-down pursuit of planned benefits. If a local improve-ment initiative is aligned with such benefits, it will be reinforced. If not, tensions will ensue. With EDIT, we approach improvement from a local perspective and see promise in supplementing top-down initiatives with the bottom-up dissemination of realized effects (Simonsen et al., 2018). The Digital Post and Epic cases provide support for such dissemination. However, we also acknowledge the opposing view that local initi-atives may dilute or work against planned, organization-level benefits. This view is, for example, advocated by Hietala and Päivärinta (2021), who find that local interests may be a threat to top-down benefits realization. In pursuing post-implementation change, Boudreau and Robey (2005) emphasize the importance of human agency because it is key to both bottom-up and top-down change. EDIT suggests that approaches to benefits realization can utilize human agency better by embracing and facilitating local improvement initiatives to a larger extent. Locally specified effects provide a handle for assessing whether local initiatives align with organization-level plans and strategies.

Fifth, it may be asked whether EDIT favors some kinds of improvement because they lend themselves more readily to specification and measurement. Ward and Dan-iel (2012) distinguish among four classes of effect, which differ in the explicitness of their contribution: financial (i.e., the effect is expressed in terms of monetary savings),

quantifiable (i.e., a target level can be set, but it cannot be expressed in monetary terms), measurable (i.e., performance can be measured and compared, but a target level cannot be set), and observable (i.e., specific people can judge effects realization using agreed-upon criteria). All four classes of effect can be pursued using EDIT. The three cases exemplify financial (Digital Post), measurable (Epic), and observable (electronic whiteboard) effects. We have also worked with quantifiable effects (e.g., Granlien & Hertzum, 2009). While the four classes cover a wide range of effects, we acknowledge that EDIT is best suited to the pursuit of effects that are not easily realized in the first attempt. EDIT primarily serves to sustain the focus on an effect and its gradual realization through multiple iterations of intervention, evaluation, and learning.

4.2   From local initiatives to wider dissemination

Local improvement initiatives may boost an organization's innovation potential and foster wider dissemination of IT improvements. Arvidsson and Mønsted (2018) propose multiple tactics for enabling and exploiting local and innovative improvement initiatives. These tactics include sequencing (i.e., mobilizing organizational support for an improvement initiative), anchoring (i.e., establishing conditions for sustaining the initiative), and propagating (i.e., facilitating the dissemination of the initiative throughout the organization). In EDIT, the up-front specification of effects may serve as an important communication tool when sequencing organizational support. Furthermore, measuring and documenting the pursued effect in a local setting help anchor the results and may form a reference point for propagating the initiative.

The participants who drive local initiatives develop competences as digital entrepreneurs (Arvidsson & Mønsted, 2018) or shepherds (Quiñones, 2014). They guide others, incite the creation of new practices, and take a leading role in disseminating improved processes. In an EDIT project at four emergency departments, we have witnessed how key participants evolved into shepherds who subsequently assumed positions with part-time or full-time responsibility for IT improvement (Hertzum & Simonsen, 2011b).

Local EDIT initiatives may specifically inspire, inform, and facilitate the wider dissemination of IT improvements in three ways. *First*, local successes may generate further innovation potential by creating momentum and serving as a reference for others to follow. In the Digital Post case, the success in the Citizen Service Center motivated similar projects in the other administrative centers in the municipality. In the Epic case, the initial initiative was restricted to three relatively simple diagnoses but its success led to a decision to extend the initiative to more complicated diagnoses and the project was propagated through regional newsletters. Organizations with strong central governance

and a high degree of process standardization may hesitate to allow and stimulate local improvement initiatives (e.g., Bansler, 2021). We have argued that EDIT can serve as a valuable supplement, rather than as an impediment, to such top-down approaches (Simonsen et al., 2018).

Second, EDIT measurements may facilitate the decision to disseminate improvement initiatives by documenting realized benefits and receiving recognition, not least from management. In the Epic case, such a decision was made on the basis of few data. Typically, more data will be needed. The importance of measurements in dissemination decisions follows the trend of big data and data-driven decision making (Brynjolfsson & McElheran, 2016; Davenport et al., 2012). Effects evaluation involves discussing the interventions and local circumstances that led to the results. This way, local measurements provide insights into the potential impact as well as the required conditions, thereby informing decisions about the wider dissemination of improvement initiatives.

Third, an evaluation infrastructure may be built and exploited over a series of improvement initiatives. By having a growing number of tools and system reports readily available for collecting evaluation data, the effort required to make measurements is reduced. Such an evaluation infrastructure eases future EDIT projects. For example, the experience-sampling app developed in the electronic whiteboard case added novel features to the evaluation infrastructure at the hospital and has potential for experience sampling in other projects.

5   Conclusion

Effects-driven IT improvement seeks to facilitate local actors in realizing additional benefit from information systems that are already in operational use. Such local innovation requires a pragmatic, yet systematic, process. We propose a process that consists of iteratively specifying, realizing, and evaluating usage effects. Effects specification shifts the local actors' focus from how they currently work to what they want to achieve. Effects realization comprises the interventions performed to transform the existing situation into one that makes the specified effect real. Effects evaluation provides data about whether the interventions have been effective, thereby facilitating learning and a sustained focus on the effect. The effects-driven process extends research on benefits realization by:

- Shifting the focus from top-down improvement initiatives to local and pragmatic ones. Most benefits-realization research focuses on top-down initiatives but many improvement opportunities emerge locally and are pursued without management support, if at all.

- Decoupling benefits realization from IT development. The post-implementation stage is long and provides for adapting IT systems and work practices to each other when users, over time, experience opportunities for meaningful change.

- Making specification and evaluation a means for pursuing local ends. This way, specification and evaluation facilitate the local achievement and wider dissemination of effects, rather than impose externally defined ends on local actors.

- Contributing to theorizing on how to generate and make the most of innovation potential. Local entrepreneurs are key to exploiting the full potential of systems but to realize the envisaged benefits they need a process for working systematically with IT improvement.

The contribution of effects-driven IT improvement is to package post-implementation improvement initiatives in a manner that combines local and lightweight experimentation with the data-driven realization of meaningful effects. In addition, each individual improvement initiative may contribute to the wider dissemination of IT improvements by creating momentum, benefits documentation, and an evaluation infrastructure. In short, we propose that approaches to benefits realization can utilize human agency better by attending more to local, post-implementation improvement initiatives.

Acknowledgments

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Appendix

Effects-driven IT improvement has its origins in effects-driven IT development, which proposed new ways of collaboration between the customer and vendor in systems-development projects (Hertzum & Simonsen, 2011a, 2011b). The central idea was to organize projects around the realization of the organizational effects pursued with the new IT system, rather than around the delivery of specified system functionality. The use of EDIT for improving IT use builds on the same idea of working iteratively with the specification, realization, and evaluation of wished-for effects. However, the iterations take place later, that is, at the post-implementation stage. Table A1 summarizes the differences between effects-driven IT development and effects-driven IT improvement.

	Effects-driven IT development	*Effects-driven IT improvement*
Stage	IT development and implementation	Post-implementation stage
Effects	Creates an early-and-onward focus on what the customer wants to attain with the system and, thereby, accentuates that it is merely a means to an end	Creates a later-and-onward focus on what local users want to attain and, thereby, bundles an existing system with new goals
Effects specification	Shifts the focus from what the system in principle affords the users in doing to what they in practice accomplish with the system, thereby bridging system functionality and system use	Shifts the users' focus from how they currently work to what they want to achieve, thereby prioritizing emergent opportunities for making locally meaningful change
Effects realization	Makes it a shared obligation for the customer and system vendor to effect change in the structures and processes of the customer organization	Makes it a local effort to effect change through initiatives that cannot count on extensive support from top management in the customer organization
Effects evaluation	Provides data, as opposed to opinion, about whether the contractual partnership between customer and vendor has accomplished its purpose	Provides input for sustaining the local focus on an effect and for supporting its diffusion to other organizational units by documenting the ensuing benefit

Table A1. The difference between effects-driven IT development and effects-driven IT improvement

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