2008

Best Practices in ERP: How good are they?

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Abstract. ERP-developers suggest that the business processes they have implemented in their software are the best practices available. This argument is used to convince new ERP-users they best organize their business processes according to the ERP-system, because only then will they fully reap the benefits of ERP. Although often used, the term 'best practice' is never defined in relation to ERP-software. The predecessor of ERP, MRP, has also been hailed as a best practice that should be implemented as programmed and would then be profitable. This turned out to be deception for many companies. This paper explores what the ERP-developers, -consultants, and -users, participating in ERP-implementations, believe 'best practice' in ERP-software stands for.

Keywords: ERP-implementation, best-practice, business process.

1 Introduction

The term 'best practices' (BP) is widely used by ERP-developers and ERP-consultants to promote the business practices offered in ERP-software. Using these practices would result in market advantages and increased profitability for ERP-users. SAP is the most prominent user of the term, but others use the term BP already for many years too [1], [2]. However, it is unclear why the practices offered for the business processes qualify as 'best'.

Two definitions of 'best' in best practice are possible. 'Best' is normative if it is based on a preset criterion or 'best' is prescriptive if it is the result of a repeatable search process among existing practices. What both definitions have in common is that both assume that what is best is not related to a particular implementation. However, Skyrme [3] argues that what is 'best' is in the eye of the evaluator and it is unclear who this is in case of ERP-software. Chief executives should ask themselves how similar their information and business processes are to those of their competitors. [4] Will adjusting a company's processes to the ERP system undermine its market strategy?

Furthermore, if the claim of BP in ERP software were true, the many failures of ERP implementations should than be caused by mistakes during the implementation process, and not by mismatches between the business practices incorporated in the ERP software and the business processes of the implementing companies since the

software contains BP [5], [6], [7]. Several empirical studies, however, show this view to be wrong [6], [9], [10]. The question remains: What is meant by BP?

A private for profit company organizes its business processes such that they best support their business strategy [10], [11], and it is through its business strategy that it tries to beat the competition. Now the BP offered in ERP-software cannot imply that there is only one (or a few) way(s) to organize business processes or that any strategy can be achieved by combining what the ERP-software has to offer. So the BP offered, even within one sector, must allow companies to differentiate from one another. But if a company really tries to gain market advantage by the way it has organized its key business processes, this will not be covered by the BP offered in the ERP-software, unless the software developers have thought of these possibilities before the company did, which seems unlikely. The new business models developed by Dell and Nike illustrate this point. The software companies involved were only able to meet the e-lean requirements after several failures [8].

This research is explorative in nature, trying to clarify the concept of best practices (BP). We will discuss to what extend the business processes offered by ERP are perceived as 'best practices' by ERP-users, -consultants, and -developers. This research is limited to BP for business processes, not BP in implementation or BP for not-for-profit organizations with common interests, such as libraries. We shall investigate whether 'best practice' is a useful concept, and what developers, consultants, and users actually mean by BP for business processes, and to what extend they believe these are present in the most popular ERP-software packages. As such this research contributes to the discussion on what to adjust, the ERP-system, or the business practices when implementing ERP. As we will show, both seem to be right to some extend.

For this explorative research two sources of information have been used. First we reviewed web-sites and other information of the ERP-developers, -consultants, and -users we interviewed. Next, we interviewed representatives of the four main ERP-developers present in the Netherlands: SAP, Oracle, SSA (formerly Baan), and Microsoft. For the products of each of these four ERP-developers we interviewed ERP-consultants (7 in total) as well as 10 users, so in total 21 semis-structured interviews were conducted. Two of the consultancy firms interviewed have developed their own industry application, one for SMEs based on Oracle and one for the Food and Beverages sector based on Navision. For the users we analyzed the implementations in some detail; see the Appendix, Table A1.) The field research was conducted in 2006-2007.

This paper is organized as follows. Section 2 reviews previous research on BP and ERP-software. Furthermore, the relationship between BP and benchmarking shall be discussed. Based on this discussion 4 hypotheses are formulated. In Section 3 the hypotheses are explored. Section 4 discusses the consequences of our findings and draws conclusions.

2 Best Practices Reviewed

Before we discuss BP for business processes it is necessary to clarify what we mean by this. For a for-profit company a business process can be defined as a collection of related activities to achieve a particular goal, which should add value for the company; examples are sales and production. These higher-level business processes can be divided into a collection of smaller business (sub-)processes that work together. Each process has input(s), an activity, and output(s), for example a process may have an invoice as input, the checking of the invoice as activity, and payment or rejection as output. How these various processes, and especially a company's core processes, are organized is strongly affected by the market strategy a company uses [10], [12]. Nowadays these processes are often supported by an ERP-system, and an ERP-system typically supports only one or at most a limited number of ways to execute these processes. It is this ERP process support, which expects a particular order of activities that is propagated as 'best practices' by ERP-vendors. Deviating from these practices often requires a change in the functionality of the software, normally referred to as customization, which is expensive and tricky when installing upgrades later. During implementations, customization is at the core of many discussions between ERP-vendors and ERP-users. The general tendency is to minimize customization because it is expensive, and for many processes it is basically immaterial for the user in what exact order activities are performed.

With ERP's claim to offer BP, history seems to repeat itself. Swan et al. [13] did research on the diffusion of the MRP II software for manufacturing planning systems during the 1980s and 1990s. They conclude that there were significant differences in focus between the Information System (IS) suppliers that implemented the MRP II concept in their production planning packages and the companies that used these packages. The IS suppliers claimed that MRP II should be considered 'best practice' for all manufacturers, and that 'one-size-fits-all' out of the box -sometimes called plain vanilla- implementation was possible. As a result users should modify their organizational setting if it did not fit the system. The users, however, discovered that this 'best practice' wasn't best at all but rather a straight jacket, and had to redesign the system to meet their needs. Did we learn from this experience with respect to one of ERP's predecessors or are we making the same mistake again?

Now one could argue that the BP offered in ERP are especially for the non-strategic processes, say accounting, since knowledge about these processes is normally not at the core of the companies business strategy, and a system with tax and auditing regulations already implemented will make life easier for a company. However, ERP-developers and -consultants explicitly state that they offer BP for the core business processes too.

In the discussion on BP 'commonly used and proven' and BP are often used as synonyms. Yen and Sheu [11] conclude that the management style used is of great importance for the implementation of standard or BP processes. In their view the BP are, however, developed by the implementing company and not the BP available in the ERP-software.

Competitive strategy and BP. What does ERP-software have to offer? The claim is that by combining industry-specific and cross-industry BP based on business process

blueprints, as offered in the ERP-software, a Business Scenario or Business Case can be formulated based on proven state-of-the-art business processes. In addition, the cost-benefit analysis of the Business Case helps the customer understand which investments are needed and what will be gained in time, money, and competitive advantage. The problem we have with this is that the process blueprints are available to all competitors. Economic theory learns that the gains in time, money and competitive advantage a company could have from improved business processes will be lost once they are 'freely' available to all competitors. The only advantage that remains may be a 'first mover advantage'. Companies develop a competitive strategy to maintain or improve their market position. Software systems have to support this strategy. Since ERP-software affects all key functions, ERP has to be aligned with a firm's competitive strategy. Common criteria to identify competitive priorities are price, quality, delivery and flexibility; criteria that are all affected by the use of ERP-software. Every ERP implementation should be aligned with the competitive strategy [7], [10], [14]. Managers have to be aware of these potential effects on competitive strategy of an ERP implementation, so they can act more proactive in planning and implementation. It will be in the processes with which a company wants to distinguish itself one would expect customization.

Based on the above discussion we formulated the following hypotheses:

H1: What are offered as 'best practices' (BP) in ERP-software are actually commonly used and proven practices.
H2: BP are not available for the strategically most important processes; that is, the processes through which an organization distinguishes itself from its competitors.
H3: Every implementation of an ERP-system requires some form of adjustment that is beyond the functionality of the system.
H4: The business practices offered in ERP-software are based on customizations for previous implementations and therefore the BP offered by an ERP-vendor will always trail behind the latest business models of a particular sector.

3 Results

In this section we discuss what we learned from the interviewing the three groups (ERP-developers, -consultants, and -users) with respect to the hypotheses. The characteristics of the implementations of our ERP-users are highlighted in Table A1.

Table A1 shows companies have diverse reasons to implement an ERP-system or revise it. Four companies implemented because the current system no longer fitted the way they conducted their business; three of those because central control needed to be improved after international acquisitions and/or moving production to other areas of the world. One company because a major customer would only do business with companies that used the same ERP-software. All the others because the portfolio of software used up till then was no longer adequate and support for (part of) it was no longer available. So half made a conscientious choice based on a strategy, and the

other half was forced by circumstances beyond their control to implement a new system. The rest of the information on the 10 cases is used below when discussing the verbal support for our hypotheses gathered interviewing users.

H1: What are offered as 'best practices' (BP) in ERP-software are actually commonly used and proven practices.

ERP-developers. Of the software developers interviewed, only the SAP representative stated they widely use the term BP to promote their products. The interviewees of the other suppliers claim they avoid the term BP and have developed alternatives like Reference Model (Oracle), Industry Solutions (SSA), or Business Flow (Microsoft) to communicate the practices they have to offer. But when searching the web sites of the other ERP-developers many references can be found to BP. However, compared to SAP, they use it much less as a main selling point.

The Oracle interviewees state that a best practice contains knowledge of a certain process and/or industry, which is laid down in process models and test scripts. The business process BP offered should be derived not only from previous implementations, but also from more general accepted BP, like GMP (Good Manufacturing Practices), which are then incorporated in the ERP BP.

ERP-consultants. Except one, all consultants state that they use the term BP. Only the SSA consultant referred to DEM (Dynamic Enterprise Modeling), which he considered a flexible tool to adjust the software instead of using predefined BP as in SAP. Surprisingly, all consultants stated not to use the term BP for what is offered by the ERP software, but for the business process concepts they have developed themselves. When asked to define BP, they used phrases like 'Experiences from earlier implementations', 'Template of business processes', 'Best application according to our experience'. Their own BP are used to convince potential customers. The consultants see the software suppliers' BP as a starting point and always use these as such for their own BP.

All consultants state that what their firm has to offer in terms of the business practices they implement in the ERP system beforehand has added value. Depending on the capabilities of the ERP-software and the tools offered, consultancy firms often develop their own solution for a particular sector. For example, one consultancy firm offers an on-demand ASP solution containing BP for small companies. The possibilities to adjust this system are limited (about 80% is fixed), but, as we learned from users 7 and 9 in Table A1, the system has clear advantages for small businesses; (i) almost all processes are covered by the system, (ii) they don't need cross educated (ICT and domain) workers, and (iii) for the first time they have clear knowledge of the cost of their ICT. Especially the latter is considered important, because before implementing ERP they never knew how much money they actually spent on ICT services, and now they do. Furthermore, if they need advice on system adjustment, they have specialists of the software company to help them, where they had to rely much more on own capacity and ad-hoc consultancy support in the past.

The consultants stated that BP are derived from earlier implementations. The consultants support the hypothesis in the sense that BP usually are commonly used practices that worked well in previous implementations. However, these practices are

not proven in the sense that they were tested and publicly discussed, as part of a best practice process, nor are there clear criteria for 'best'.

ERP-users. The companies visited did not use the term BP. Six of the ten ERP-users stated they had developed their own business practices (Table A1, Row 4), which they considered best, before selecting/adjusting an ERP system, and these were leading for the implementation. However, all companies stated that they do not consider themselves unique, and that the solutions offered by the software supplier and/or consultant were expected to cover all processes. All mapped out their own business processes in more detail during the ERP implementation to find a fit between their processes and what was offered. Except two, all companies had used (parts of) an enterprise wide solution before (see Table A1, Row 2), and had learned either the hard way themselves or from others that customization is expensive and should be avoided when possible.

That BP are difficult to achieve is illustrated by the fact the stripped Oracle version for small business offered as an ASP solution, and designed by one of the consultancy firms did not cover all requirements. The two small companies (Users 7 and 9 in Table A1) for cost reasons preferred to use (almost 100% of) the implemented practices without changes or additions. (Note that the consultant uses the term best for these practices.) However, even though the companies are small, adjustments to the software were required.

User 6 (a large hospital) uses the suppliers BP. But the hospital is part of a consortium of six hospitals that work together with Oracle to develop BP and many problems had been resolved in earlier implementations. The system is mainly used for finance and logistics, ranging from medical supplies to specialized meals. Even though the hospital interviewed is one of the last to implement, it required additions to the system for several business processes.

Conclusion on H1. The interview results support H1 only partly; what is offered as best practices in ERP software are indeed commonly used practices. Why they are best or whether they are proven is questionable. The practices included in ERP have not been benchmarked nor have they been part of a best practice process; that is, they have not been independently researched, nor has there been a public debate on their effectiveness. What happens is that ERP-developers use a selection of customizations in previous implementations to adjust their software and they decide what is 'best'. We conclude that what is offered as BP in ERP are commonly used practices, but is not the result of a process to find BP; they are not properly benchmarked, or otherwise proven to be best. The only BP process we encountered was organized for practices on which companies (in this case hospitals) don't compete.

H2: BP are not available for the strategically most important processes; that is, the processes through which an organization distinguishes itself from its competitors.

ERP-developers. SAP and Microsoft (as ERP suppliers) both state that BP are offered for strategically important processes as well as for support processes. SAP states that a company should implement its BP for its core processes to become a

leading company. What Microsoft offers for business processes is much less. It is questionable whether this covers much of what is strategically important, since it are Microsoft's partners that develop specific customer or industry solutions. Oracle takes an opposite stand, the more strategic the process, the more it will divert from the BP. Only about 80% of the business processes is covered by the standard package. SSA stated that in their segment of the market an ERP-system does not cover all processes; some customer processes will always be so specific that a generic ERP-system cannot cover these. However, they state it is unclear if these processes are of strategic importance or that the adjustments are the result of the particularities of a company's operational processes.

ERP-consultants. There was no agreement among ERP consultants about the possibilities to use BP for all processes and especially the strategic important ones. Several respondents mentioned the subject 'Service management' as a key process that was currently not sufficiently covered by the ERP-system. However, they all agreed that what is missing or insufficiently covered by the ERP-system is very much customer dependent.

ERP-Users. Several companies knew when they decided to use a particular ERP-system that add-ons were available for their sector to cover parts of the business processes that were not (well enough) covered by the standard ERP-system. However, except users 4 and 9, all companies stated that at least some business processes that are crucial for the way they conduct their business are insufficiently covered by the ERP-system implemented.

The two small companies (users 7 and 9) stated that the Oracle based ASP-solution for SMEs they acquired was too extensive. They understood that in a larger company business processes and authorization need to be split, for example credit check and order clearance. In small companies there is less need for this, the same person or department does what are several processes in a larger company. The bureaucratic requirements of the ERP-system lead to unnecessary data handling, but this was regarded a minor problem, since the new system had major advantages, of which cost and information control stood out.

Conclusion on H2. Based on the above evidence we conclude that H2 is accepted. The BP offered do not cover all processes considered of strategic importance by the ERP-users. However, it depends on the particular market approach used and product sold which processes these are.

H3: Every implementation of an ERP-system requires some form of adjustment that is beyond the functionality of the system.

ERP-developers. All ERP-developers believe that there will always be a need to customize, but to what extend differs. As reported above, Oracle estimates that on average about 80% is covered by the system. Also SSA states that, given their market of high tech production companies, their software is not required to cover all processes and on average about 10-20% of what customers need (or would like to have), needs to be developed during the implementation process. SSA uses the term

'modification' instead of customization, because the complexity and the uniqueness of some of the business processes of their high tech customers makes it impossible to cover all processes in one ERP-system. Given Microsoft's design philosophy its products will not cover all that is required, but it is not supposed to. SAP believes it covers all but rather unusual processes, so customization is normally not required. However, all suppliers believe that with the increasing maturity of the systems, an increasing number of implementations will use the standard BP offered.

Remark 1. The philosophy behind the ERP-systems offered differs with respect to customization. In case of SAP this is not promoted since SAP tries to have an extensive enough repository of reference models. Additions to SAP are normally based on feedback to SAP rather than building one's own solution. For the other three (especially Microsoft), the possibility to add solutions for business processes is part of their ERP philosophy.

ERP-consultants. The consultants state that they first use parameterization (setting the parameters) of the ERP-system to find a fit between a company's processes and the ERP-system. If there are areas were there is no fit, they first will try add-ons. They claim that only if these solutions don't work they opt for customization. Except one, all consultants stated that on average only about 80% of the functionality needed is actually available in the ERP-system implemented. They all try to keep the amount of custom-made software to a minimum or when possible encourage the customer to wait for the next release. The reason for this is that customization will result in extra work with every new implementation, which leads to extra costs for the customer and diminishing customer trust, and long term customer relations are valued over short term extra work.

Except one, all ERP-consultants interviewed stated that they have hardly ever seen a plain vanilla implementation. This is in spite of the fact that all described the ERP solution they worked with as very flexible, allowing for adjustments to meet the particularities of their customers' business processes. The most important reasons for customization are inadequate backing of some of the (standard) business processes by the software. Only one consultant mentioned a lack of knowledge by the implementing company as another reason for customization. The others thought customers are knowledgeable enough to make good decisions. The decision to customize is usually taken during the exploration phase at the start of the implementation. However, the consultants acknowledged they regularly underestimate the particularities of a customer's business processes, resulting in a decision to customize during the actual implementation process due to insufficient flexibility of the ERP-software.

ERP-users. Almost all users claim that the solution they have chosen is very flexible and supports their needs sufficiently. However, except two, all had new functionality (customizing) added due to inadequate or missing business processes in the ERP-software. Examples are lack of functionality for quality control, handling of transport documents, inadequate e-procurement, insufficient support for web applications, product configuration, and service management (was mentioned several times), appropriate vendor managed inventory, the ability to use more than one price

structure for the same product, and the ability to scan risk prawn product in- and outflows.

In all cases, the management discouraged customizing business processes from the start. The ERP-users stated that, despite the fact that all wanted to minimize extra work, their standard ERP-system on average covered only about 75-80% of the way they wanted/needed to implement their business processes and in one case this was even 30-40%. To get to the 75% they had to adjust business processes, but they stated that these adjustments were not perceived as critical. Not everything that was missing according to the ERP-users had to be customized. A distinction was normally made between need-to-have (about 10-15% of the missing 20%) and nice-to-have (5-10%). But even in case of need-to-have, the cost of customization was sometimes considered too high and therefore other solutions were used to circumvent the misfit.

If functionality does not exist or is insufficient and an add-on is not available either, it is sometimes possible to design a workaround to avoid customization. Workaround stands for 'informal temporary practices for handling exceptions to normal workflow' [15]. Six companies stated they used workarounds as an extra tool besides add-ons to solve functionality problems; see Table A1, Row 7. This was done either by exporting data to other software, use them and then import the results again, or by using and combining the ERP functionality available different than originally intended. Company 4 stated that the extensive use of workarounds made it possible to avoid customization. They worked together with SAP on this and in a later release SAP used these insights to adjust the ERP-software.

The add-ons used were mostly brought to the ERP-users' attention by the consultants. All ERP-users are in the end (very) satisfied with the results of the implementation. However, all still have wishes for functionality to be included, but these were too expensive. All expect that these perceived shortcomings will be repaired in the future.

Conclusion on H3. There is strong support for H3. Every implementation of an ERP system requires some form of adjustment that is beyond the functionality of the standard ERP system. On average an estimated 20% customization was needed to meet the pre-implementation requirements. This estimate was about the same for consultants and users, but also two of the software developers mentioned a similar percentage. There is, however, a difference of opinion between users and consultants on how much of this 20% is really necessary and how much is actually 'nice-to-have'. Customers tend to estimate the amount need-to-have higher then consultants do.

H4: The business practices offered in ERP-software are based on customizations for previous implementations and therefore the BP offered by an ERP-vendor will always trail behind the latest business models of a particular sector.

ERP-developers. All ERP-developers stated that additions to the ERP-software are usually based on generically usable software parts that had previously been custom made to support particular business processes. Customization is often based on new business or organizational models developed by ERP-users; see users 1, 2, 3, 6 and 10. If considered interesting enough -that is there is sufficient market for it-, a customization is worked over and incorporated by the ERP-developer in a future

standard software release. The improved solution must, however, been tested in implementations, and, as Oracle put it, the new business process BP must be in line with more generally accepted business BP before incorporating them into the software.

Since the BP implemented are actually based on previous implementations we asked all four ERP-developers whether customers ever requested explicitly that what was developed for them was not to be used elsewhere. Only one confirmed that had ever happened. In some cases a time lag is deliberately added in order to allow the company that paid for the customization to cash in on its competitive edge, but no real life examples were provided for this.

ERP-consultants. All consultants agree on the fact that the BP offered are not state of the art in the sense that they cover the latest business practices, because they are available only after earlier implementations and after the ERP-developer has decided it is commercially interesting to add a new business process. However, most of the consultants have encountered new additions to software releases that were custom made first by consultants. Furthermore, customization for a new business practice is often developed and implemented for several ERP-users, so the ERP-developer then has more than one customization available. The ERP-consultants also point out additions they would like to have available to the ERP-developers, but it was clearly stated that the ERP-developer decides on what is added and when.

The ERP-consultants also mentioned the possibility of cross-fertilization among sectors. Business practices developed or used in one sector of the economy are adjusted and applied in other sectors by ERP-consultants, speeding up the dissemination of new business models. However, this is not necessarily a success and can result in a large demand for customization (User 10).

ERP-users. ERP-users too state that, when implementing an upgrade of an ERP-system, the system regularly comprises new functionality, which was only available as customization before. However, the latest business practices of a sector are normally not readily available.

Conclusions on H4. This hypothesis is strongly supported. The practices implemented in ERP-software and offered as BP are based on customizations in previous implementations. However, new business models (new market approaches, outsourcing, globalization, etc.) developed by ERP-users, require new business processes. These latest developments, developed to gain competitive advantage, will not be covered by ERP-software. We conclude that the BP offered always trail behind the latest business practices asked for by a particular sector.

5 Discussion and Conclusions

This research shows that what are offered by ERP-developers and -consultants as BP for business processes do not qualify as best. What is offered as BP by ERP-vendors (developers and consultants) is not the result of a repeatable and public process to

determine whether a practice is best -even if we assume that 'best' can be determined independently of the context-, nor are there objective criteria to measure best. The fact that the practices are based on previous customizations is helpful, but in our opinion insufficient to qualify them as best, unless best stands for: We believe not to have implemented a better way to do this in our software (yet). What are offered as BP are (more or less) successfully demonstrated practices at best. As far as the ERP-users are concerned, what is best depends on their market strategy.

Except two, all implementations needed (unexpected) additions -on top of add-ons- to the software to meet customer requirements. The users needed this customization for processes regarded important for their strategy. Which processes these are, depends on a particular company's market strategy.

Although all users aimed at no customization and changed their processes as much as possible to meet the requirements of the ERP-software, the software covered 80%-90% at most, a percentage that was mentioned by most ERP-vendors too. However, even in the two cases where no customization was implemented, workarounds had to be used or lack of coverage accepted for cost reasons. Surprisingly this percentage seems not to have changed over the last 8 years [16].

Now, were the ERP-users' expectations unrealistic? Most companies used consultants to advice them, and based on the advice received they formed their expectations. Of course we don't know how the consultants actually formulated their advice, but from the interviews we learned that the expectations of consultants and users might differ considerably. With the exception of the two smallest companies, all companies build up sufficient knowledge on the software beforehand to be as much as possible in control of the software implementation and utilization.

Consultants that have a vast experience in a particular sector know most variations in business processes that occur, but even then a complete plain vanilla implementation is rare. Not because the ERP-software is inadequate, but because companies develop new business models requiring changes in business processes that are novel and inventive. The way a company conducts its business is unique at least at some points and thus doesn't fit the system. Given the constant interaction between company goals, company culture, market strategy and new technologies, it is unlikely this cycle will ever end. With ubiquitous technologies becoming available everywhere, new business models will be developed requiring adjustments to the software.

Most companies are not fully satisfied with the services offered by consultants, and the same goes for consultants, they experience the services of the software developers as too little and the adoption of the system to changing demand as too slow. This does, however, not mean that both groups qualify their suppliers as insufficient. In general the services offered are qualified as adequate and good.

Contrary to what we expected, none of the ERP-users who had its system customized claimed the property rights for this. On the contrary they would be happy if what they had custom made would be part of the standard software in the next release, this despite the fact that several of these customizations were very important in realizing the company's strategy.

This explorative research suggests that those authors and practitioners that believe that ERP is a way of doing business, and business processes should be adjusted rather than adjusting the ERP system to meet the needs of the company, make the same

mistake as MRP II vendors did. It is through the organization of its business processes a company achieves its business strategy and when it really matters companies do not, and in our opinion should not, adjusts their business processes.

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Appendix

Table A1. Implementation profiles

	Item	User 1	User 2	User 3	User 4	User 5
1	ERP package	SAP R/3	MS Axapta	MS Navision & SAP	SAP All-in-one	MS Navision
2	Previous software	SAP per site	Various packages and own software.	MAPICS and System 2.1	Accountview	Various packages and own software.
3	Reason for change	Control over various sites and adding new processes.	One solution in all refrigeration divisions required.	Large customer's request.	Control of various sites after expansion and new business processes.	Too much patchwork.
4	Business process defined beforehand	Yes	Yes	Yes, together with business consultant and competitors.	Yes, but at high level using business consultant.	Yes, with help of business consultant.
5	Customization needed	Yes	Yes, and decided when describing processes	Yes	No, from start rejected for cost reasons.	Yes
6	% processes covered by			} 95%		
	- ERP-system	80%	50%		100%	70%
	- Add-ons	90-95%	20%		-	15%
	- Customization	-	30%		-	15%
7	Used workarounds	-	-	Yes.	Yes, extensively.	Yes.
8	Adjustment needed for business process	Service management, quality management.	Quality management had to be replaced; Service management.	Job floor, engineering order leads	Not needed.	Scheduling, bar coding, authorization, project management.
9	Implementation inadequate for	Local/global authorization, transport documentation.	Authorization.	Document flow.	Collecting cartridges.	-
10	Software knowledge build up	Self.	Self; key users and competence centre.	With consultant.	Self, using key users.	Self.
11	Used consultant(s)	Several, each for different areas.	Only when really necessary.	Yes, several, finally one with NAV industry solution.	Yes	Yes
12	Request for new practices by ERP-developer	Yes, plant abroad functionality; communicated with SAP.	No	Yes	No, but some of their non-standard solutions in SAP now offered by SAP	No
13	Problems after implementation	Well-trained people leave to work as consultant.	Add-ons did not work well; documentation insufficient.	First 2 years, but not anymore.	Not really. Now SAP reference user. Integration with other packages needed.	May be too much customization.

Table A1. Continued

	Item	User 6	User 7	User 8	User 9	User 10
1	ERP package	Oracle hospital solution.	Publicsoft Oracle ASP.	MS Axapta.	Publicsoft Oracle ASP.	SSA (Baan).
2	Previous software	Baan for Finance.	KAFTA.	Improve.	Exact, Davilex, Snelstart.	HISCOM (Baan).
3	Reason for change	Baan no longer appropriate.	Software no longer supported. ASP solution wanted.	Supplier stopped. (First tried Navision.)	Too much (HR) capacity needed for ICT.	Improved effectiveness and efficiency of logistics.
4	Business process defined beforehand	Cooperation with 5 other hospitals.	No, only current processes and wish list described together with consultant.	No.	No.	No.
5	Customization needed	Yes.	Yes.	Yes.	No.	Yes.
6	% processes covered by		< 100%		100%	
	- ERP-system	90%		> 80%		60-70%
	- Add-ons	-		} < 20%		-
	- Customization	5-10%				30-40%
7	Used workarounds	-	Yes.	Yes.	Yes.	No.
8	Adjustment needed for business process	Interfaces with other hospital systems; barcoding; e-procurement; treatment debtors.	Budgeting, report management, cash register. Product description. Less flexible inventory management.	Service management. International value added. Government regulation.	-	Use of ubiquitous technologies (scan, web portal, etc.) for logistical processes.
9	Implementation inadequate for	-	Product descriptions.	-	-	Authorization.
10	Software knowledge build up	ASP solution, work with solution vendor	ASP solution, work with solution vendor.	Yes, key user approach.	ASP solution, work with solution vendor.	Yes, own ICT department.
11	Used consultant(s)	Yes.	Yes, solution vendor.	Yes, same as before.	Yes, solution vendor.	Yes.
12	Request for new practices by ERP-developer	No.	Some adjustments made during implementation.	No.	Some adjustments made during implementation.	Long issue list.
13	Problems after implementation	No.	Link to web shop. System too extensive for small company, but excellent support.	Service management inadequately programmed.	No, but system too extensive for small company, but excellent support.	Adequate reporting. Many issues not resolved yet.