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Best practices in business process redesign: validation of a redesign framework

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Abstract

A fundamental challenge in any Business Process Redesign (BPR) project is to come up with a new process design that is in one or more ways superior to the existing plan. Based on earlier research, a framework to help the designer in selecting the proper best practice(s) for this purpose is presented and validated in this paper. It is described how the framework is used in generating improved process designs for two Dutch organisations. Furthermore, the results from a survey are presented, which has been carried out among BPR practitioners in the UK and the Netherlands to test the framework. The overall conclusion is that the framework is indeed helpful in supporting process redesign and that its core elements are recognised and put in practice by the BPR practitioner community. The framework, therefore, may be of direct interest to both academics and practitioners active in the process improvement field.

Keywords: BPR; Case study; Survey; Framework; Best practices

1. Introduction

Although overhyped, sharply criticised, and re-branded repeatedly over the past 15 years, business processes redesign (BPR) has remained on the agenda of many organisations. The simple reason is that it is one of the most powerful ways to boost business performance and raise customer satisfaction. Currently, in industry and the academic world there is a growing interest for a field that is referred to as Business Process Management [1]. Because ''Business Process Management is all about transferring the results of BPR into production'' [2] it is more than probable that the interest for what is the essence of BPR, inventing new processes to do business, will rise again in the coming years.

This paper aims at defining a framework to help the process designer in choosing the correct best practice

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when trying to deliver a process design that is in some sense superior to the existing one. We will refer to this task as *the implementation of BPR*, to distinguish it from other important BPR aspects and phases (e.g. project and change management). The framework also lists and classifies a set of best practices in BPR. The idea behind a framework is to help practitioners by identifying the topics that should be considered and how these topics are related [3]. It is not a model of a business process, but rather an explicit set of ideas that helps in thinking about the business process in the context of redesigning.

To define such a framework, we first have investigated existing frameworks in literature and adapted them for the specific purpose of BPR projects. Next, we have applied the framework and the set of best practices in redesign studies for two service organisations, as presented in this paper. The results led to a preliminary validation of the framework and a classification of most used best practices. Finally, we have conducted a survey amongst Dutch and UK practitioners and experts in the field of BPR that helped reconsider and validate our findings.

The organisation of this paper is as follows. The first section describes our initial framework, the set of best practices, and some open questions for these subjects. The second section illustrates their application to two organisations and the conclusions drawn. The third section provides findings from the conducted survey on BPR. Finally, the conclusion describes the validated framework and best practices and discusses further implications and research.

2. Initial BPR framework and set of best practices

2.1. The BPR framework

We have explored in the literature several frameworks and business process analysis models that were potentially suitable for business process redesign. In [4] we explain how we have derived an extended framework for implementing BPR best practices. It is derived as a synthesis of the WCA framework by Alter [3], the MOBILE workflow model by Jablonski and Bussler [5], the CIMOSA enterprise modelling views of Berio and Vernadat [6] and the process description classes of Seidmann and Sundarajan [7]. In our framework, six elements are linked (refer to Fig. 1):

- the internal or external *customers* of the business process;
- the *products* (or services) generated by the business process;
- the business process with two views:
  a. the *operation view*: how is a business process implemented? (number of tasks in a job, relative size of tasks, nature of tasks, degree of customisation), and
  b. the *behaviour view*: when is a business process executed? (sequencing of tasks, task consolidation, scheduling of jobs, etc.);
- the participants in the business process considering
  a. the organisation *structure* (elements: roles, users, groups, departments, etc.), and
  b. the organisation *population* (individuals: agents which can have tasks assigned for execution and relationships between them);
- the *information* the business process uses or creates;
- the *technology* the business process uses, and finally;
- the *external environment* other than the customers.

In this paper we aim at investigating if this framework is relevant and valid. At first, we were quite

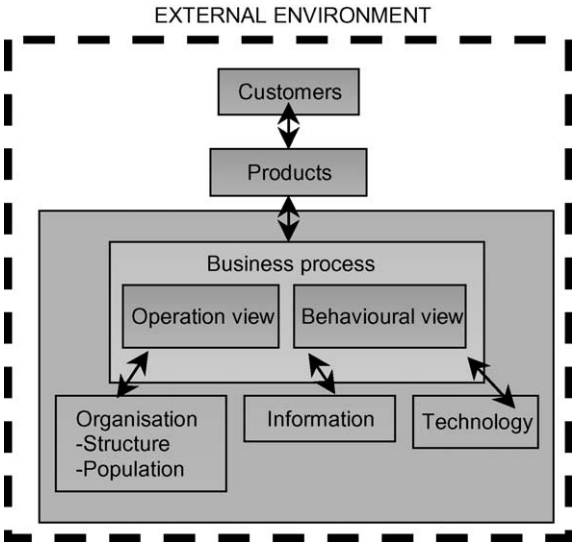

Fig. 1. Framework for BPR implementation.

Table 1
BPR best practices classified according to our BPR implementation framework

Framework elements	Best practice name	Definition
Customers	Control relocation	Move controls towards the customer
	Contact reduction	Reduce the number of contacts with customers and third parties
	Integration	Consider the integration with a business process of the customer or a supplier
Products	None	
Operation view	Order types	Determine whether tasks are related to the same type of order and, if necessary, distinguish new business processes
	Task elimination	Eliminate unnecessary tasks from a business
	Order-based work	Consider removing batch-processing and periodic activities from a business process
	Triage	'Consider the division of a general task into two or more alternative tasks' or 'consider the integration of two or more alternative tasks into one general task'
	Task composition	Combine small tasks into composite tasks and divide large tasks into workable smaller tasks
Behavioural view	Resequencing	Move tasks to more appropriate places
	Knock-out	Order knockout decisions in a decreasing order of effort and in an increasing order of termination probability
	Parallelism	Consider whether tasks may be executed in parallel
	Exception	Design business processes for typical orders and isolate exceptional orders from normal flow
External environment	Trusted party	Instead of determining information oneself, use results of a trusted party
	Outsourcing	Consider outsourcing a business process in whole or parts of it
	Interfacing	Consider a standardised interface with customers and partners
Organisation: structure	Order assignment	Let workers perform as many steps as possible for single orders
	Flexible assignment	Assign resources in such a way that maximal flexibility is preserved for the near future
	Centralisation	Treat geographically dispersed resources as if they are centralised
	Split responsibilities	Avoid assignment of task responsibilities to people from different functional units
	Customer teams	Consider assigning teams out of different departmental workers that will take care of the complete handling of specific sorts of orders
	Numerical involvement	Minimise the number of departments, groups and persons involved in a business process
	Case manager	Appoint one person as responsible for the handling of each type of order, the case manager
Organisation: population	Extra resources	If capacity is not sufficient, consider increasing the number of resources
	Specialist-generalist	Consider to make resources more specialised or more generalist
	Empower	Give workers most of the decision-making authority and reduce middle management
Information	Control addition	Check the completeness and correctness of incoming materials and check the output before it is sent to customers
	Buffering	Instead of requesting information from an external source, buffer it by subscribing to updates
Technology	Task automation	Consider automating tasks
	Integral technology	Try to elevate physical constraints in a business process by applying new technology

confident, as it is a synthesis of previously validated frameworks described in the literature. However, we had concerns about whether all the elements should be dealt with during the implementation of BPR. Also, we wanted to know how important each element is in the implementation process and whether practitioners give some aspects of the framework a higher priority over others.

2.2. BPR best practices

Within our framework for BPR implementation, we have gathered and classified best practices in BPR. Over the last 20 years, best practices have been collected and applied in various areas, such as business planning, healthcare, manufacturing, and the software development process (e.g. [8–10]). In [4] we have described such best practices intended to support the redesigner of a business process in facing the technical BPR challenge: the implementation of an improved process design. The paper also discussed the advantages and drawbacks of each best practice. A qualitative evaluation was also undertaken to assess the best practices against their impact on time, flexibility, quality and cost issues. The ''Devil's quadrangle'' of Brand and Van der Kolk [11] was used for the purpose.

Table 1 summarises the identified best practices within the BPR implementation framework and their definitions. For more information, references, case studies and examples of these practices, the interested reader is referred to the previously mentioned reference [4].

Several authors mentioned the above best practices as having a positive impact on enhanced business processes. However, many questions remain unanswered: how far are these rules used in redesigning real processes within organisations? Is it possible to classify them? Can we derive a ''top 10'' list of best practices? Is our qualitative assessment of the best practices' impact valid? etc.

2.3. Approach

To answer some of the identified questions in this section, we set out the following approach. As a start, we used our framework in implementing some best practices in BPR to two Dutch companies we have been in close contact with. The intention of these case studies is to get a firmer idea of the importance of the various best practices and the usability of the framework. We discuss the subsequently raised issues around this framework in Section 3.

Next, we have conducted an electronic survey amongst experienced Dutch and UK practitioners in BPR to assess the validity of our framework against their practices. These results are discussed in Section 4.

3. Framework and best practices' validation through two case studies

3.1. Case studies description

In 2002, we applied the BPR framework and its best practices within two Dutch organisations. The occasion for cooperation with these organisations was their participation in a longitudinal study into the effectiveness of workflow management (WfM) systems in which the authors are involved [12]. These types of systems enable the automatic coordination of business processes (for more information, refer to [1,5]).

The first organisation involved is a local municipality of 90,000 citizens in the northern part of the Netherlands. The specific department in question was the Urban Management Service, responsible for sanitation, parking facilities, green spaces, and city districts. This service employs over 300 civil servants. The second organisation is a provincial office of the national public works department, employing about 1000 civil servants. This office's primary responsibility is the construction and maintenance of the road and water infrastructure in its province.

Both organisations selected their *invoice processing* workflow to be supported by a WfM system. The municipality handled about 10,000 invoices in the years 2000 and 2001. For the public works office, that amount was approximately twice as high. In addition to these processes, the municipality also aimed to automate its *purchasing process*. On a yearly basis, the Urban Management Service puts out some 700 purchasing orders.

For both organisations, we estimated the effects of applying BPR to the three mentioned processes and implementing WfM technologies to support these processes. The identified list of BPR best practices

played a major role in this estimation, as explained in the next paragraph. We have created new computer simulation models on the basis of the models representing the initial situation in both companies. The development of the various simulation models for each business process under the various circumstances is depicted in Fig. 2 and explained in further detail below.

A number of alternative models were built for each of the two invoicing processes and for the purchasing process. The starting point for all these models is the *initial model*. This initial simulation model captures the existing process structure and includes real behavioural data of the process on the arrival patterns of cases, resource capacity, service time characteristics, etc. In [12] we explain in some more detail how this initial model is built, how the data has been gathered and how the model is validated against the real world.

The next type of model that was built models the situation where *only* the 'Integral technology' best practice was applied to the current process, i.e. the use of WfM technology to support the existing process. We will refer to this type of model as the *WfM-model*. The typical effects of WfM technology on process performance were incorporated, as identified in [1] and [5]. For example, transportation activities that exist in the current process were eliminated from the initial model, because WfM technology will take care of these.

Next, in preparation of the *BPR-model*, we determined for each single best practice whether it would be applicable in the context of the specific process. If so, we constructed for such a *single* best practice a simulation model where the effect of this specific best practice was incorporated on top of the existing *WfM-model*. To model the best practice accurately, we used estimations from experts from both organisations to approximate the local effect of such a single BPR best practice within the process. In addition, we used the results from simulating such a WfM-model *extended with just this single best practice* to determine the overall performance improvement.

Finally, for the three business processes under consideration, the *BPR-model* incorporates a subset of all applicable best practices. This subset seemed the best combination in terms of performance improvement. Whether a best practice was included in the final *BPR-model* was determined during two workshops that involved end users, managers, and IT professionals for both organisations.

3.2. BPR implementation and results

The simulation model (*BPR-model*) was used to test how appropriate it was to apply other BPR rules than the implementation of WfM technology alone. The evaluation of the relevance of the various best practices is given in Table 1. The table displays the results of the evaluation of each best practice for the three processes. The table indicates whether a best practice was applicable and, if so, whether it produced significant results and whether it was subsequently included in the finally redesigned process.

It is important to note here that the municipality was primarily interested in reducing *labour cost* by reducing the average service time spent on cases for

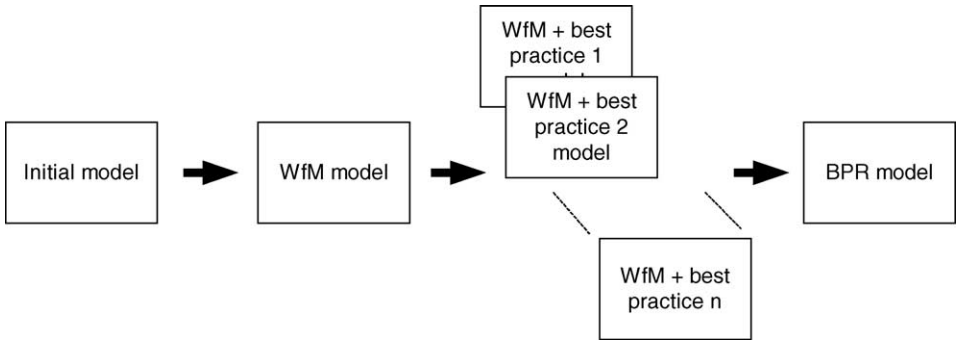

Fig. 2. Derivation of simulation models.

Table 2
Evaluation of best practices applicability to studied business processes

Framework element	Best practice	Municipality						Public works		
		Invoices			Purchasing			Invoices		
		A	S	I	A	S	I	A	S	I
Customers	Control relocation									
	Contact reduction							✓	×	×
	Integration	✓	×	×	✓	×	×	✓	×	✓
Operation view	Order types									
	Task elimination	✓	✓**	✓	✓	✓**	✓	✓	✓**	✓
	Order-based work							✓	×	✓
	Triage							×		×
	Task composition	✓	×	✓	✓	✓**	✓	✓	✓**	✓
Behavioural view	Resequencing	✓	×	✓				✓	✓**	✓
	Knock-out									
	Parallelism				✓	✓*	✓			
	Exception									
Organisation: structure	Order assignment				✓	✓**	✓	✓		✓
	Flexible assignment									
	Centralisation									
	Split responsibilities									
	Customer teams									
	Numerical involvement	✓	✓**	✓						
	Case manager									
Organisation: population	Extra resources									
	Specialist-generalist	✓	×	✓	✓	×	×	✓	×	×
	Empower				✓	✓**	✓	✓	×	✓
	Control addition				×		×	×		×
Information	Buffering									
Technology	Task automation									
	Integral technology	✓	✓**	✓	✓	✓**	✓	×	–	×
External environment	Trusted party									
	Outsourcing									
	Interfacing									

A: applicable, S: significant, I: incorporated in the redesign, ✓: yes, ×: no.
* Significant using a two-sided 90% confidence interval.
** Significant using a two-sided 99% confidence interval.

both the invoice processing and purchasing process, while the public works office aimed at reducing the cases' average *lead time* for their purchase order process. Significant results were therefore measured in these terms.

Analysing Table 2, it follows that the best practices with the widest applicability are: 'Task elimination', 'Task composition', 'Integration', and 'Specialist-generalist'. These best practices were applicable in all three cases. The 'Task elimination' and 'Task composition' best practices were estimated to be the most effective, as they delivered significant results in respectively all and two out of three processes. Statistical significance was established when there was no overlap between the two-sided 99% confidence intervals of the performance measure in question (i.e. lead time or labour cost), resulting from simulation experiments of the WfM model and the same WfM model extended with the best practice in question. The relative importance of the various best practices is given in Fig. 3. This score is determined by calculating how often the best practice was considered to be

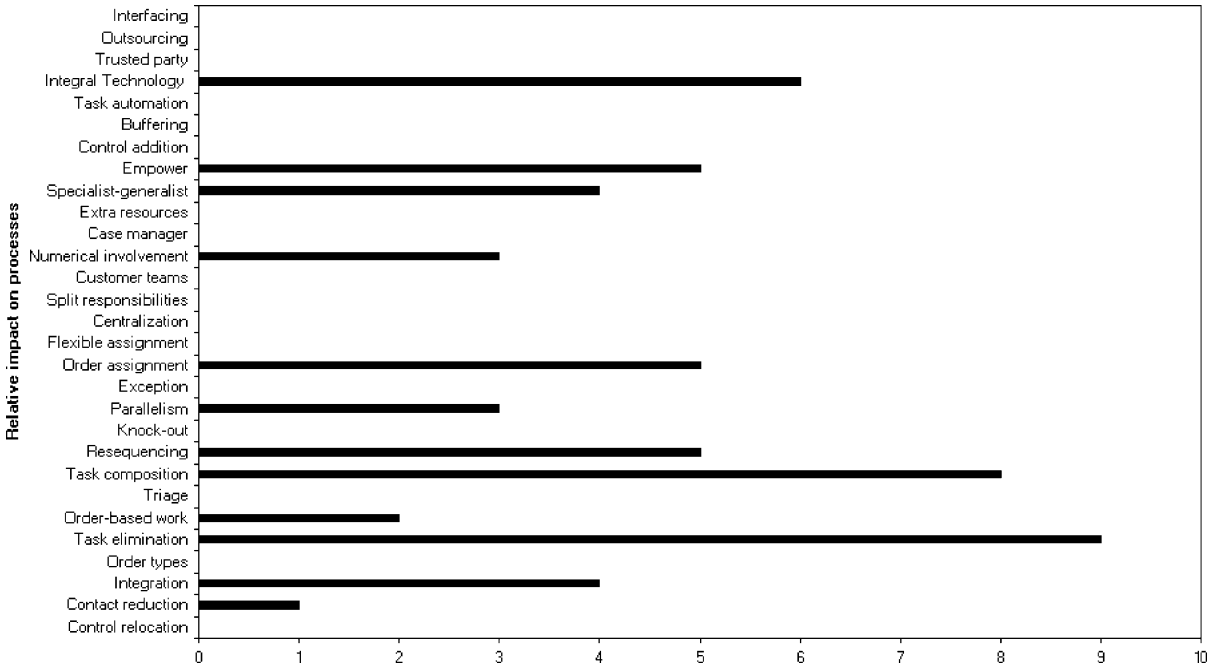

Fig. 3. Best practices relevance for the BPR-model.

applicable and significant for the process and whether it was finally incorporated in the redesign. The highest score was obtained by the 'Task elimination' best practice. The latter was incorporated in all three redesigned processes.

A relative comparison between the different situations is graphically displayed for each of the three processes in Fig. 4.

From the results in Fig. 4, it can be seen that the BPR-model in all situations by far delivers the best results. In the case of the public works invoicing process, the average lead time was expected to be reduced by almost 80%, where the sole introduction of WfM technology would only account for 25%. It is perhaps not very surprising that the public works office decided to combine the implementation of WfM technology with a redesign of their invoice processing (i.e. to apply the selected other best practices as well). The actual process performance 3 months after the implementation was completed, as could be determined on basis of the management information the running WfM system generated, concords almost exactly with the estimated effects.

The municipality, however, did not decide to conduct BPR, which they found too great an organisational risk considering the expected gains. Currently, the implementation of the WfM systems has been put on hold within this organisation, because of budget problems and the municipality is looking for a cheaper alternative for the WfM technology.

3.3. Implications for the framework and the set of best practices

Using this framework during the analysis and redesign stages proved to be useful to identify and structure the involved business processes. On the one hand, it helped us to distinguish the proper angles for applying the best practices to the current process. On the other hand, it stimulated the discussions during the workshop with the domain experts. All the elements of the framework were dealt with and none of them appeared to be irrelevant for the redesign. As far as the best practices are concerned, the implementation and interviews conducted with both the managers and actors of the processes revealed that a smaller set of best practices could have been considered. This is reflected in Fig. 3, as a number of best practices emerges as having a potentially much higher impact on business processes than others. As a consequence,

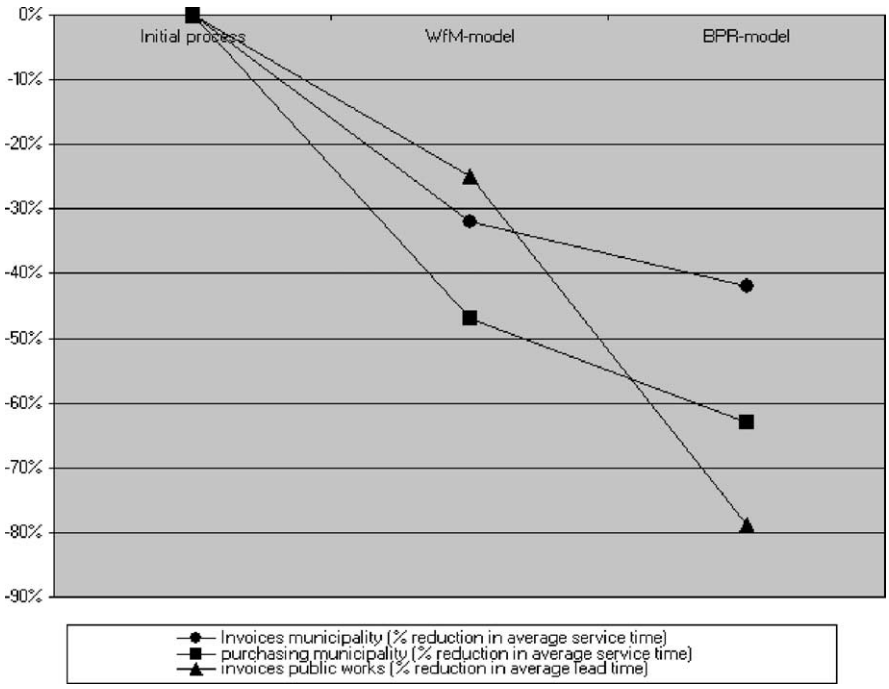

Fig. 4. Relative reduction in performance indicators.

we have established a ''top 10'' list of most popular best practices. Our ranking was established using the two case studies where the 10 best practices appeared to be most popular. To classify the best practices that had equal/close ranking, we used our literature review (i.e. how often was a given best practice cited in the literature?). The list of the 10 most popular best practices is provided in Table 3. The table also links each best practice to an element of our framework.

At this stage of our research, we have managed to answer some of our initial questions about the best practices: how far are these practices used in companies? Is it possible to classify them? Can we derive a ''top 10'' list of best practices? However, we still felt that the framework and an assessment of how useful the best practices could be, would be accurate only if they are applied to a wide range of companies or if they are validated by trusted and experienced practitioners in BPR. So, we decided to conduct a survey amongst Dutch and UK practitioners, as the first option is only feasible on the long term.

Table 3
Most popular best practices in business process redesign

Ranking	Best practice	Framework element
1	Task elimination	Operation view
2	Task composition	Operation view
3	Integral Technology	Technology
4	Empower	Organisation: population
5	Order assignment	Organisation: structure
6	Resequencing	Behavioural view
7	Specialist-generalist	Organisation: population
8	Integration	Customers
9	Parallelism	Behavioural view
10	Numerical involvement	Organisation: structure

4. Framework and best practices' validation using a Dutch/UK survey

The survey took place in 2003 and targeted well-established practitioners in the BPR field. To select potential participants to our survey, we decided to focus on Dutch and UK practitioners as we were based in both countries and wanted to exploit our local contacts with BPR practitioners. The survey excluded pure academics or, to be more precise, academics who could not show evidence of experience in BPR projects within/with real organisations. Practitioners

Table 4
Participants' profile

Practitioners	Dutch sample	UK sample
Sample size	31	60
Response rate (%)	42	20
% of BPR practitioners	92	92
Years of experience	Range: 7–35; average: 14.8; mode: 15	Range: 10–35; average: 20; mode: 10
Self-expertise assessment	Range: 5–10; average: 7.8; mode: 8	Range: 4–10; average: 6.75; mode: 6

were selected according to the company they represented (e.g. well-established consulting groups) and also according to their track record in BPR, e.g. as could be concluded from published case studies they authored. The survey was conducted using an online questionnaire that was sent to participants using emails (mapping in the questionnaire). The email explained the context of the survey. The context was emphasised by pointing the participants to an online review of previous BPR surveys. The review aimed at positioning our survey against the previous ones and clarifying our expectations. Table 4 shows that for both samples (Dutch and UK) the vast majority of practitioners had more than 15 years of experience and ranked their own expertise in the field close to 7 on a scale of 1–10.

Many surveys exist in the literature about business process *reengineering* [13,14,16–19]. However, we could not find specific ones related to business process *redesign*, i.e. surveys related to how the process should be articulated in terms of tasks and resources, for example, as opposed to how to manage the changes in an organisation. The aim of our survey is to validate our framework (refer to Fig. 1) and the impact of the 10 selected most popular best practices (refer to Table 3). As a consequence, we have decided to test the following hypothesis.

Table 5
Practitioners' ranking of framework elements

Framework elements ($N = 25$)	Average	Mode	Median
Customer	3.72	4	4
Information	3.36	4	4
Product	3.40	4	4
Operation view	3.08	3	3
Behaviour view	2.92	3	3
Organisation	2.88	3	3
Technology	2.84	3	3

H1. The framework for BPR implementation that we have developed is valid and covers all possible aspects practitioners look for when redesigning processes.

H2. All the rules that have been identified as ''best practices'' (refer to Table 3) are indeed applied extensively by practitioners.

4.1. Survey structure

The survey consisted of four major parts. The first part included general questions to determine our respondents' profile and to assess their expertise in BPR. The results are indicated in Table 4. The second part included questions designed to validate our framework. We have asked the participants to rate and discuss how much and how often they focus on each framework's element when undertaking a BPR project. (mapping into questionnaire) To avoid confusion on the meaning of each framework element, we did not use its designated terms but explained it. The term ''Operations'' view of the framework might be ambiguous and interpreted differently by participants. So, instead we used ''The way a workflow operation is implemented (i.e. the number of tasks in a job, the relative size of tasks, the nature of the tasks, the degree of customisation)''. The results of the second part are indicated in Table 5 and in Fig. 5. The third part of the survey listed the 10 most popular best practices we have initially selected. Participants were asked to express whether they had used any of the best practices listed and, if so, how often. (mapping into questionnaire) Again, to avoid confusion on the meaning of the best practices, we phrased our question in a way that would avoid ambiguity. For example, for the 'Task Composition' best practice rather than asking if the participants had already used the best practices we asked: ''Have you combined small tasks

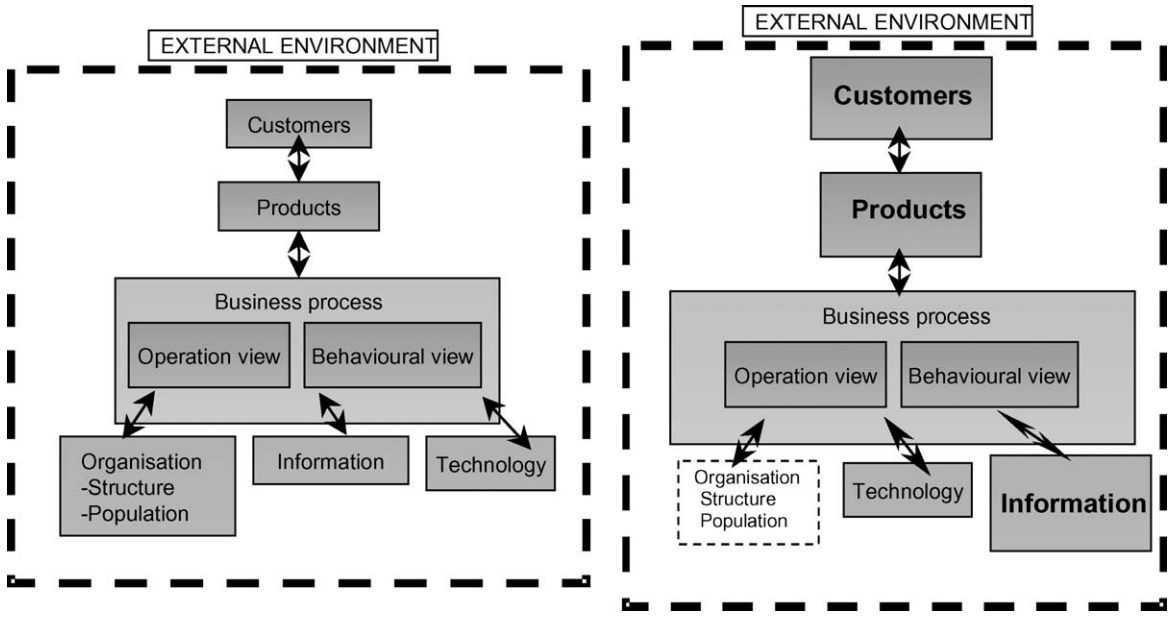

Fig. 5. Comparing initial and validated BPR framework.

into composite tasks and divided large tasks into workable smaller tasks?''. In addition, for each best practice we provided a link to a simple and short example where the best practice is applied. For the earlier mentioned best practice we provided the example of a conference registration procedure. The results are indicated in Table 6.

Participants also ranked the impact of each best practice on the quality, the flexibility, the time and the cost performances of a given best practice (not covered in this paper). At the start of the survey, these performance criteria were explained. For each best practice when the respondent was asked for his or her opinion on its impact, hyperlinks were provided to the original explanation of these notions. In the last part, participants were asked to indicate whether they had used the best practices in their most successful (and least successful) project. They were also asked to indicate the best practices that contributed the most to a BPR project's success. In this paper, we only relate the results of the first three parts.

Finally, it is important to note that the questionnaire was tested before it was sent out on a group of 10 academics, both experts and non-experts in BPR. The

Table 6
Classification and level of usage of best practices amongst participating practitioners

Ranking	Best practice	% Usage	Frequency	Framework element
1	Task elimination	94	All participants used it six times or more	Operation view
2	Integral business technology	94	16/17 participants used it between two and five times	Technology
3	Task composition	89	15/17 participants used it between two and five times	Operation view
4	Parallelism	88	15/17 participants used it between two and five times	Behavioural view
5	Specialist-generalist	88	15/17 participants used it between two and five times	Organisation: population
6	Resequencing	88	15/17 participants used it between two and five times	Behavioural view
7	Integration	76	13/17 participants used it between two and five times	Customers
8	Empower	76	13/17 participants used it between two and five times	Organisation: population
9	Numerical involvement	76	13/17 participants used it between two and five times	Organisation: structure
10	Order assignment	53	9/17 of those who used it did so two and five times. The remaining used it only once	Organisation: structure

feedback we gathered led us to make several adjustments, especially with respect to its length. The comments we received gave us the impression that there was no confusion on the meaning of the questions. That is why we felt quite confident that these concepts would be clear to a community of practitioners in BPR, carefully selected for their broad experience in the field.

4.2. Framework analysis and validation

Practitioners from UK and the Netherlands were asked to assess the validity of our BPR framework. For each element of the framework (Customer, Information, Product, Operation and Behaviour view of a business process, Organisation and Technology) participants were asked to express *how much they focused on each element when redesigning a business process*. They were offered to answer 'never', 'sometimes', 'often' or 'almost always'. We have ranked these options from 1 to 4. Table 5 displays the results of participants' answers using the latter ranking. In this table we use a point estimate for the means (average values) for the scores practitioners attributed to each element of the framework as an indication of their distribution. We provide median and modes as the major indicators for the scores.

At this point in the survey, our sample size is composed of 25 participants. We acknowledge that a sample size of at least 30 would have been better for the analysis (see e.g. [21]). However, we remain quite confident in the interpretations we can derive from this analysis because of the heterogeneity of the population. The respondents we targeted were carefully selected amongst trustful and experienced practitioners in BPR with years of hands-on experience. We analysed whether there was a bias to an industry over the other, but this was not the case. Also, we compared our sample size and response rate to the other BPR surveys we know of. Although our sample size at this point of the survey is relatively low, the response rate of 27% is higher than that of most other studies. Finally, our qualitative interpretation of the results, taking into account the numerous comments we received from the respondents, ensures a valid interpretation.

In our initial framework, we included the eight aspects mentioned in the table above. Aspects with the highest scores were 'customer', 'information' and 'product'. All of these gathered an average, mode and median score expressing to their use as 'often' or 'almost always'. From these, 'customer' and 'product' are the least surprising ones as they centre on *what* is being produced for *whom*. Less obvious is the 'information' aspect. Our interpretation is that the aspect refers to an area where large improvements can be made using BPR. This is supported by some of the comments of the respondents, e.g. that of respondent NL22: '*Invariably, process improvement requires information improvement* (*be it not always computerised*)'. The comment also makes the distinction clear between the 'information' and 'technology' aspect.

Before the survey, we expected that all of the eight framework's elements would receive fairly high scores. However, the aspects 'behaviour view', 'organisation' and 'technology' received an average score which indicated a use lower than 'often' (i.e. 3). However, considering the modes and medians of these aspects, most of them still reach a level indicating their use as 'often'. To us, this seems a positive and much more meaningful indication of these aspects' relevance, considering the qualitative scale used.

In the case of the 'organisation' aspect, the qualitative support was not so evident from the few respondents who considered this aspect to be valuable. However, when the respondents were asked in the following part of the survey for missing parts from our framework, we received the following responses of elements that were used ''almost always'':

1. ''To ensure the solution fits with the *culture* of the business.'' (UK13)
2. ''The design of the business process is also affected by the competences of the *people* that execute them.'' (NL21)

Both of these seem to clearly refer to the organisational aspect of a BPR initiative, which makes it difficult to decide that this aspect is not relevant within a BPR initiative.

Finally, we received one more response of an aspect that was used ''almost always'', although it was not present in our original framework:

3. "Lack of *process information* is another origin of problems." (NL28)

In our view, this comment is relevant as it extends our interpretation of the 'information' aspect from "the information the business process uses or creates" to "the information the business process uses or creates and information about the process execution itself".

Our overall conclusion is that our framework is recognised and supported by the community of BPR practitioners. Aspects of the framework that seem to be in the centre of attention in a BPR initiative on both sides are 'customers', 'products' and 'information'. These are presented in bold in the figure of the validated framework, to signify their relevance.

There is only one problematic aspect, i.e. the 'organisation' aspect. There is no immediate and firm support for incorporating it within our framework. However, our inquiries into missing elements seem to suggest that this aspect is relevant nonetheless. We have graphically depicted the questionable status of this aspect by showing it in dotted lines in our validated framework (see Fig. 5). One explanation for the ambiguous status of the 'organisation' aspect could be that BPR initiatives typically try to break away from existing organisational structures and attitudes, exactly to achieve great benefits. As respondent NL30 puts it: '*Considering the organisation aspect in a BPR initiative is only the last step, only to be taken after logical and executable process models have been designed*'.

To summarise, this section addressed the validation of our first hypothesis (i.e. the framework for BPR implementation that we have developed is valid and covers all possible aspects practitioners look for when redesigning processes). The discussion in this section and the comparative initial and final framework (refer to Fig. 5) indicates that the framework elements as we have identified them from analysing the literature and applying to the case studies described in this paper are all relevant and should be addressed in a BPR effort. However, we realised that some adjustments had to be made to our initial framework, essentially as to the relative importance of the elements. The 'organisation' element was the main questionable part of the framework, as discussed earlier. Also, the survey revealed the lesser importance of the 'behaviour' and 'information' elements. Not surprisingly, the 'customer' and 'product' elements appeared to be crucial in the redesign effort.

4.3. Best practices analysis and validation

As far as the best practices are concerned, we wanted to validate through this survey the validity of our classification of top 10 best practices (refer to Table 3). For this sake, participants were asked whether they have used a specific best practice in their BPR projects and, if so, how often (refer to results in Table 6). At this stage 30% of the participants stopped the survey, only providing answers about the framework validation. We think that this is linked to the relative length of the survey.

In the following, we indicate percentages of participants who recognised a best practice as valuable and how often they have used it in their projects.

Obviously, the figures in Table 6 support our initial classification of best practices as largely popular amongst practitioners. For *each* best practice, the *majority* of participants mentioned to have used them at least 2–5 times in earlier BPR projects.

Interestingly, although most participants agreed that they would mostly focus on the 'customer', the 'product' and the 'information' elements of our framework when redesigning a business process, the widely applied rules are chosen and classified according to the 'operation', the 'technology' and the 'behavioural' elements of our framework. We might conclude that in order to obtain a business process of which the aims are customers' oriented (good service, good product, good information flow), process designers need to focus primarily on the operational and behavioural views of a business process, as well as on the structure of the processes.

Finally, it is noticeable that the bottom of the list includes the 'Order assignment', the 'Numerical involvement' and the 'Empower' rules (all related to the 'organisation' element of our framework). This is consistent with the validated framework, as participants seemed not to focus much on the organisational part when redesigning a business process. We had reflected this fact by displaying the 'Organisation' element in a dashed box in Fig. 5.

Some clues to support this exclusion might be found in some participants' comments about the relevant best practices. For example, on the 'Order assignment' best practice ('Let workers perform as many steps as possible for single orders') a participant (UK8) noted that he never uses the rule because the '*segregation of duties may limit the stages that one operative can perform as may the limit of an individual employees training. Simply having one operative do more of the process is not necessarily an improvement*'. On the 'Numerical involvement' ('Minimise the number of departments, groups and persons involved in a business process') another participant (UK9) claims that '*Au contraire, we recognised that core processes cuts across department and invite the group to work together*'. Finally, on the 'Empower' best practice ('Give workers most of the decision-making authority and reduce middle management') the same participant justified the non-usage of the rule by claiming that '*This involves redefining the organisation structure and governance authorities*'.

As far as validation of the second hypothesis is concerned (i.e. all the rules that have been identified as ''best practices'' (refer to Table 3) are indeed applied extensively by practitioners), our initial ranking of best practices (Table 3) is close to the findings of this survey's participants (Table 6). In both cases, the first three mostly used best practices are 'Task composition', 'Integral business technology' and 'Task elimination'. These three rules are strongly related to the essence of BPR as IT is reported to be an essential component of reengineering and involves analysing tasks' usefulness [20]. Besides, in both tables both the 'Numerical involvement' and the 'Integration' rules are not that popular. We have already explained that this is consistent with the validated framework. Finally, compared to Table 3, one important difference is the 'Parallelism' best practice's position. Parallelism implies 'Considering whether tasks may be executed in parallel'. The participants' assessment of this best practice is, we think, much more in-line with the potential benefits it might bring (drastic cut of process time). Possibly, the parallelism rule simply was not relevant to the specific projects we have discussed in Section 3. This confirms the usefulness of conducting a survey on top of assessing rules' applicability to a small number of real organisations.

5. Discussion

A valid question now is: How do our framework and the set of best practices support BPR practice? Our ideal of delivering a comprehensive and sound methodology for BPR practitioners definitely requires us to take some further steps, as we will reflect upon in our conclusion. However, some guidelines can already be given. First, the conducted case studies and the survey allow us to indicate which areas are vital during a redesign process. We demonstrated that the focus must go beyond the process in itself and must embrace the customers, the product, the information views and, to a lesser extent, the technology and the organisation part. In [15] there is support for this direction, as is demonstrated through a set of industry case studies: reengineering is more successful when a *wider view of BPR* is adopted.

Next, we have classified in this paper the best practices according to the mentioned framework elements. We strongly suggest that our previous paper [4] should be read in conjunction with the present one. That previous paper provides a comprehensive review about each best practice, in particular the main advantages and disadvantages of using each of them are discussed. The review also includes a checklist of the currently available tools and techniques that support each best practice. It also indicates, qualitatively, the impact of the best practice within the devil's quadrangle framework. In other words, it gives general indications for the kind of effects one may expect from applying a best practice. Finally, it provides pointers to case studies where the best practice was applied successfully.

In lack of a mature methodology we feel we can propose ourselves right now, we recommend practitioners to [22] and [23]. First of all, these provide ''cook book'' like procedures to e.g. identify, describe, and analyse current business processes. Secondly, they describe how workshops can be used to stimulate creativity among its participants to come up with improved and organisationally accepted designs. We believe that our validated framework could be used to structure such a workshop-centred approach, ensuring that each of its elements receives attention. Furthermore, the best practices we describe may provide guidance to the workshop participants for the kind of changes they can suggest. For example, a question a

workshop facilitator may want to ask on the basis of the 'Task Composition' best practice is: ''Are there any steps in the existing process that could be combined, so that the process could be executed faster and chances on hand-off mistakes are minimised?''.

In summary, we provided through this and previous work insight into the advantages and disadvantages of each best practice, the context in which they should be applied (i.e. the framework's element), and which best practices are most popular amongst practitioners and should therefore be considered with priority by redesigners.

6. Conclusion: BPR framework and best practices validation

In this paper we have described a framework for classifying best practices in business process redesign. The purpose of this framework is to set up the grounds for a directed methodology for BPR projects' implementation. The framework indicates the major areas a practitioner needs to focus on when redesigning a project: the customer, the products and the information flow. It also points out to other important areas such as the behavioural and the operation view of a process and the technology that should support the redesigned business process.

We provided a set of redesign rules that we believed were popular amongst practitioners. The rules are gathered to provide practitioners ideas on different implementation options for a new process. In this paper we have demonstrated the validity of the BPR framework and best practices through two steps. In the first step we have tested them on two organisations that considered a BPR project. In the latter step, we have used a survey amongst practitioners in BPR. Both steps allowed us to conclude on a validated framework (refer to Fig. 5 and to hypothesis H1 in Section 4) and to select a ''top 10'' list of best practices amongst practitioners (refer to Table 6 and hypothesis H2 in Section 4). The future research directions are as follows:

- At first, we would like to analyse the impact of the top 10 best practices on the flexibility, the cost, the time and the quality as perceived by practitioners.
- Secondly, to investigate for all best practices when, where and how to apply or not apply them. This means giving indications to the size of the business process or the tasks involved. Also, it should study the relative impact of best practices on a business process. In this area, in [24] the popular combination of the empower and the triage best practices are studied (leading to decentralisation and task consolidation). It is proved, using mathematical models, that this combination is sub-optimal in many cases.
- At last, to provide users with a methodology in applying best practices. This includes using our classification of the best practices within the framework for BPR implementation as a basis (which was one of the purposes of this paper), and deriving a guideline to the order/conditions in which the best practices should be implemented. Several authors have already published relevant work in this area. In [25] a streamlining of business process redesign rules is provided. In [26] a framework is provided for analysing BPR in conjunction with several strategic dimensions. However, these approaches do not consider the full set of best practices we described in this paper.

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