Information gathering during Enterprise System selection – insight from practice

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Structured Abstract

Purpose

The purpose of this paper is to examine the information gathering methods used during Enterprise System (ES) selection among Polish organizations and to have IT consulting experts evaluate these methods which will result in identification of the preferred approach for the information gathering task during system selection.

Design/methodology/approach

The research has a qualitative exploratory design with the grounded theory being the main research method. A mixed quantitative–qualitative approach to data collection was used: an e-mail-based survey was used as an introductory stage to gather data on information gathering methods. The results of the survey were evaluated by ES experts during unstructured interviews. The interviews were then transcribed and coded according to the grounded theory coding techniques.

Findings

The evaluation of selection approaches revealed that the approach to information gathering should depend on the level of configurability of the systems subject to selection. Two generic approaches were identified: requirements driven – for highly configurable systems and system functionality driven – for the systems offering limited configurability. Interaction between the customer and the bidder was also identified as the main condition for preparing the unbiased offer by the bidders.

Research limitations/implications

Regarding the survey study, as the survey sample was small and the sample selection process was not random, the results should not be generalized to the whole population of Polish enterprises. It would be also beneficial to test the validity of the findings from the

grounded theory study on the big population of Enterprise System bidders with the use of statistical methods.

Practical implications

For highly configurable systems, a model that includes a business process analysis, detailed requirements' specification and dedicated system functionality presentation is the preferred approach. A workshop is preferred to obtaining a ready requirements list. For systems offering limited configurability, an approach centered on system presentation is more suitable. In this case the requirements should be gathered during the presentation on a 'gap-fit' basis.

Originality/value

A significant lack of the research that explores the selection process with the stress on organizational needs and system functionality information gathering and makes indications for improvement of this process from the consulting enterprise (bidder) point of view was identified. This paper aims to fill this gap by presenting the results of a survey among Polish enterprises regarding selection routines and the evaluation of these routines by expert ES professionals, resulting in the development of the preferred set of information gathering methods.

Keywords:

Enterprise System selection, requirements specification, IT management decisions, decision making, requirements engineering, ERP

Introduction

Enterprise Systems (ES) were formerly identified with Enterprise Resource Planning (ERP) applications (Davenport, 1998; Sedera and Gable, 2010). Rosemann (1999) defines an ERP system as 'a customizable, standard application software which includes integrated business solutions for the core processes (e.g., production planning and control, warehouse management) and the main administrative functions (e.g., accounting, human resource management) of an enterprise.' These systems have evolved into application suites, including ERP, CRM, Business Intelligence, Workflow, Content Management and other functionalities, which are required to support information and workflow in organizations. Generalizing the above definition, one can state that an Enterprise System is a standard, customizable application suite that includes integrated business solutions for the major business processes of an enterprise, with the ERP system remaining the central component of this suite.

Enterprise Systems are the backbone of most global manufacturing and service enterprises (Muscatello and Chen, 2008) and they continue to draw attention of the researchers. When combined with carefully planned organizational changes, they can lead to substantial business benefits (Gefen and Ragowsky, 2005; Shang and Seddon, 2002; Velcu, 2007), and they became a fundamental tool in many industries, a 'must have' to maintain the competitive position on the global and local markets (Helo et al., 2008). Though ES is a popular piece of business software, its implementation failure rate is constantly high (Aloini et al., 2007; Wu et al., 2007; Poba-Nzao et al., 2008). This fact has yielded much research on Enterprise Systems' implementation success/failure factors (e.g., Dezdar and Sulaiman, 2009; Soja and Paliwoda-Pękosz, 2009); however, according to the ERP literature reviews (Esteves and Bohorquez, 2007; Deep et al., 2008), most publications concentrate on the detailed examination of a project's implementation phase. The research on the preceding phase of the

Enterprise System lifecycle, which is system selection (or adoption) is far more scarce. This should draw attention of the researchers, as systematic selection policy is considered to be crucial to the future success of a project (Aloini et al., 2007; Vilpola and Kouri, 2005; Lien and Chan, 2007; Wu et al., 2007; Bakås et al., 2008; Muscatello and Chen, 2008; Karsak and Özogul, 2009) and the selection process itself is a complex and time-consuming management decision endeavor (Rolland and Prakash, 2000; Wei and Wang, 2004; Lin et al., 2007). Most of the literature regarding system selection concentrates on the selection criteria and affecting factors (Haddara & Zach, 2011), however the main outcome of the selection phase, and the most difficult one to achieve is the fit/gap analysis between the organization's functional requirements, and the system functionality (Rolland and Prakash, 2000; Wu et al., 2007). The key element of the gap/fit analysis is gathering of the information about the requirements and the system functionality in such a way that they can be compared to each other.

The literature review performed later in this paper reveals that most of the research regarding the selection phase concentrates on the design of the new methods of system selection, requirements engineering and gap-fit analysis. Exploratory research on the information gathering during system selection is far more scarce. Furthermore, most existing papers take a perspective of the adopting organization and omit the active role of software vendors (consultancies) in the selection process. Vendor or implementing company consultants are an important party in the selection process (Sedera and Gable, 2010; Lech, 2011), as their role is to understand the adopting organization's requirements, provide the reliable information about the system functionality and determine the feasibility of the requirements in the system by preparing and offer. Furthermore, the experience of a consultant covers more than one bidding situation and thus allows for better generalizibility than examination of a single case from the adopting organization point of view.

The purpose of this paper is therefore to explore the ES selection process; in particular:

- to explore the Enterprise System selection process in Polish organizations, stressing the information gathering methods used during selection,
- to have IT consulting experts, involved in ES offering on the vendor side, evaluate these methods and to identify the preferred approach for the information selection task.

1. Enterprise System Selection – literature review

1.1. Enterprise Systems' characteristics affecting the selection process

As stated above, an Enterprise System is a standard, customizable application suite that includes integrated business solutions for the major business processes of an enterprise, including, but not limited to, ERP, CRM, Business Intelligence and Workflow systems.

The two major characteristics of an Enterprise System are that it is 'standard' and 'customizable'. Enterprise Systems are 'standard applications' in that they provide a set of already-developed functionalities. This characteristic prompts most authors (e.g., Vilpola and Kouri, 2005; Soffer et al., 2001) to include ES in the Commercial Off-the-Shelf (COTS) software category. Adjusting the functionalities provided by an ES to meet organizational needs is performed via configuration (and, if needed, customization), which, in most systems, includes selecting between the variants of existing functions by setting the configuration parameters. These Enterprise Systems characteristics also affect the requirement analysis during the system selection process (Soffer et al. 2001), as 'requirements for choosing off-the-shelf information system differ from requirements for development of new information

systems in that they do not necessarily provide complete specifications, thus allowing flexibility in matching an existing IS to the stated needs.' The answer to the specific business requirement that involves selecting an existing system functionality rather than developing new software from scratch significantly impacts the requirements formalization level needed. The requirement formalization level needed when selecting an ES is smaller than that needed during the software development project planning process.

However, the literature commonly ignores that 'standard' is not synonymous with 'ready to use'. Some authors state that Enterprise Systems include pre-defined procedures for performing all major processes in an enterprise and that, during system selection, one must evaluate the fit between these procedures and organizational needs and identify the gaps (Vilpola and Kouri, 2005; Daneva and Wieringa, 2010). While such an approach is generally correct, one must remember that the more 'configurable' the system, the less 'ready-to-use' it is just after installation. Large Enterprise Systems, including SAP, Oracle and IFS, provide several thousands of configuration parameters that allow hundreds of thousands of scenarios for which the system can work. It is difficult to determine what a 'standard process' means in such a setting, as such systems require substantial configuration before they are 'ready to use'. When handling such systems, one must determine not only the fit between the system's standard functionality and organizational needs, but also, first and foremost, how to configure the standard functionality to fit these needs. The consultants with expertise in implementing the system are needed to clarify these issues and give input for the selection process. As they usually do not work for the adopting company, but for the system vendor or the independent consultancy offering system implementations (Sedera and Gable, 2010; Lech, 2011), they need to be able to understand the requirements correctly and to address them while answering the request for proposal. Only after this is done, the 'fit-gap' approach may be used. There are also systems with fewer configuration options, which either are dedicated to smaller and simpler organizations or offer a best-of-breed solution for a certain industry. The 'fit – gap' approach would be suitable for such systems without needing any modifications.

1.2. Enterprise System Selection Process

The Enterprise System implementation process is long and risky (Soja, 2008) for many reasons, including people, processes and technological risk factors (Nelson, 2007). One risk that emerges long before a project starts is selecting an inappropriate system (Bakås et al., 2008). The selection process should thus be performed carefully, using the available best practices.

Table 1 presents the general descriptions of the ES/ERP system selection process retrieved from the literature:

Table 1. System selection process descriptions

Reference	Selection process description
Illa et al. (2000)	ERP software acquisition is the following decision process: clearly define the need that should be fulfilled with the help of an ERP product and/or related service; find suitable products and services; establish criteria for the evaluation of the ERPs; evaluate products and services in the light of these criteria; and select the best available product/service; negotiate the final contract.
Stefanou (2000)	The system selection consists of three phases. The first phase considers the business vision as a starting point for ERP initiation/acquisition. The second phase consists of the detailed examination and definition of business needs, and of the various constraints. […] The third phase considers the selection of modules of the core system that support critical business practices and of any additional applications the enterprise may need in view of the requirements analysis

	performed in the previous phase.
Verville & Halingten (2003)	This ERP acquisition process model includes six distinctive, yet interrelated, processes: planning, information search, selection, evaluation, choice, and negotiations.
Araujo & Araujo (2006)	ERP system acquisition process can be organised according to the following steps (which do not need to happen sequentially): • define a needs document, • prepare and post an RFP (including the requirements identified in the needs document), • establish criteria to assess bids, • receive proposals, • find alternative sources of information, • evaluate products and services offered, • select the product, vendor, and integrator, and • negotiate and sign contract with the product provider and integrator.
Dawes et al. (2007)	Seven major decision stages that characterise large-scale purchase decisions are: fact finding about organisational needs, system specification, search for information about suppliers, determination of decision criteria, review of bids, shortlisting of suppliers, and recommendation of a supplier.

Table 1 shows that all the authors identify the following steps in the selection process:

- definition of organizational needs,
- information gathering on system functionality,
- evaluation of alternatives (based on previously established criteria),
- selection of the most suitable system, and
- contract negotiation and signature.

The first two steps in the above procedure aim to prepare the decision-makers to make an informed decision on the competing alternatives. The proper execution of this stage strongly affects the rest of the selection process, as the evaluation of alternatives and selection of the most suitable system can be performed correctly only if the criteria for this evaluation and selection, developed during the information gathering, are also correct. The literature review, presented in Table 1, indicates that an informed system selection decision requires two types of information:

- organizational needs (requirements), regarding the new system,
- system functionality, considering the fulfillment of the previously specified organizational needs.

Having ‘complete’ information about what is expected from the new system and how the competing systems can fulfill these expectations allows an unbiased decision and choosing the system that best fits the organizational needs. However, both types of information needed for this decision are complex and hard to quantify, as well as time- and resource-consuming to gather. The ‘complete’ information about how the system fits the organizational needs is available only after fully implementing this system, and organizational needs are also not stable. The decision-makers thus face a dilemma concerning the amount of time and resources they should use and the information-gathering methods they should apply to obtain good enough information to make the right decision. As more time and resources are used and more sophisticated the information-gathering methods are applied, the more ‘complete’ information is produced. Conversely, there is a time, resource and budget limit for these analyses in a ‘real world’ environment. The question arises about how enterprises should handle the information gathering task to obtain am optimal information accuracy/information cost ratio.

Various authors have investigated and/or presented Enterprise System selection frameworks, concentrating on all or some of the steps identified in Table 1 and addressing them with varying levels of detail. The review of the literature is included in Table 2.

Table 2. System selection literature review

Reference	Reserarch type	Main research method	Research results/finding	Perspective
Araujo and Araujo (2006)	Descriptive/normative	Case study	Case study, selection process one organization, lessons learned, indications for requirements specification	Adopting organization
Bakås et al. (2008)	Design science	Design	High level selection framework	n/a
Baki and Cakar (2005)	Exploratory/descriptive	Survey	Selection criteria	Adopting organization
Bernroider and Koch (2001)	Exploratory/descriptive	Survey	Selection process	Adopting organization
Cebeci (2009)	Design science	Design/Case study	Selection methodology for a certain industry	Adopting organization
Daneva (2004)	Descriptive/normative	Case study	Summary of 13 case studies, indications for requirements engineering	Consulting organization
Deep et al. (2007)	Descriptive	Case study	Case study, selection process in a specific setting	Adopting organization
Everdingen et al. (2000)	Exploratory/descriptive	Survey	Adoption and selection criteria	Adopting organization
Illa et al. (2000)	Design science	Design/Case study	Formal requirements and system fit modeling methodology	Adopting organization
Karsak and Özogul (2009)	Design science	Design/ Case study	Decision framework for ERP software selection based on quality function deployment, fuzzy linear regression and zero–one goal programming	Adopting organization
Liao et al. (2007)	Design science	Design	Formal methodology for system selection	n/a
Lien and Chan (2007)	Design science	Design/Case study	Fuzzy AHP selection model	Adopting organization
Maiden et al. 1997	Descriptive/normative	Case study	Lessons learned, indications for requirements specification	Adopting organization
Rolland and Prakash (2000)	Design science	Design/Case study	Requirements – system functionality alignment model	Adopting organization
Soffer et al. (2001)	Design science	Design	Formal methodology for requirements-functionality alignment	n/a
Soffer et al. (2003)	Design science	Design	Formal methodology for requirements-functionality alignment	n/a
Soffer et al. (2006)	Design science	Design/Experiment	Formal methodology for requirements-functionality alignment	n/a
Stefanou (2000)	Design science	Design	High level selection framework	n/a
Verville and Halingten (2003)	Exploratory/normative	Case study/model	Selection model based on the generalization from 4 cases	Adopting organization
Vilpola and Kouri (2005)	Design science	Design/Case study	High level selection framework	Adopting organization

Wei and Wang (2004)	Design science	Design/Case study	Formal methodology for comparing the systems	Adopting organization
Wu et al. (2007)	Design science	Design/Case study	Formal requirement and system fit modelling based on task-technology fits theory	Adopting organization
Yazgan et al. (2009)	Design science	Design	Selection model with the use of neural network	n/a

As it can be seen from table 2, majority of the papers (15 out of 23) use the design science approach to the selection process. The design science approach requires, among others (March and Storey, 2008): 'development and presentation of a novel IT artifact (constructs, models, methods or instantiations) that addresses the problem [and] rigorous evaluation of the artifact'. However these steps should be preceded with the 'demonstration that no adequate solutions exist' and this element is not present. The authors seem to make a tacit assumption that the existing evaluation methods are not good enough without adequate evidence from the field. Most of the remaining papers are single case studies, describing the selection process in a real-life setting and drawing indications for improvement of this process on this basis. Two papers (Daneva, 2004; Verville and Halingten, 2003) were identified to use multiple case study approach. Furthermore, all the papers except one take a perspective of an adopting organization. Only Daneva (2004) presents the experience of a consulting team from 13 ERP implementation projects, discussing the blueprinting phase, which is performed after the system has been selected. The above literature review shows a significant lack of the research that explores the selection process with the stress on organizational needs and system functionality information gathering and makes indications for improvement of this process from the consulting enterprise (bidder) point of view.
This paper aims to fill this gap by presenting the results of a survey among Polish enterprises regarding selection routines and the evaluation of these routines by expert ES professionals, resulting in the development of the preferred set of information gathering methods.

2. Methodology

The literature review and discussion from the preceding sections have proven that there is a significant lack of fieldwork on system selection in general, and information gathering in particular, as most authors concentrate on the design science approach. Furthermore, Enterprise Systems are treated in the existing literature as a homogenous group, which may not be correct, as the differences between the systems in size and level of configurability may affect the approach to the selection process. As some of the assumptions, made in the existing literature, regarding the level of requirements' formalization and homogeneity of the ES population may prove to be biased, a qualitative exploratory study is justified (Creswell, 2009, p. 99). As 'in qualitative study, inquirers state research questions, not objectives or hypotheses' (Creswell, 2009, p. 129) the following research questions were posed:

RQ1: What methods regarding information gathering on organizational needs and system functionality are used by Polish enterprises during the Enterprise System Selection?

RQ2: How should the information gathering process be performed to provide optimal system fit to the organizational needs?

To answer the research questions, a mixed quantitative–qualitative approach to data collection was used, as discussed by Miles and Huberman (1994). These authors state that: 'Both types of data can be productive for descriptive, reconnoitering, exploratory, inductive, opening-up purposes.' A survey was used as an introductory stage of the study to describe the selection practices used in real-life setting, with the stress on information gathering. The main part of the study used the grounded theory approach (Strauss and Corbin, 1998) to get an insight on how the information gathering part of the selection process should be designed in

the opinion of the IT consulting professionals. Grounded theory is well established in IS research (Myers, 1997; Urquhart, 2007) and is suitable for exploratory, inductive research based on raw qualitative data (Oliver et al. 2005).

The design of the study follows the sequential procedure, described by Miles and Hubberman (1994, p. 42): 'An initial survey helps point the field-worker to phenomena of importance; the field-worker (then) moves to develop a close-up, strong conceptual understanding of how things work […]'.

3. Enterprise System Selection – a survey

The initial stage of the study was a survey conducted among Polish enterprises to determine the ES selection practices that they use. To design a survey, unstructured interviews were conducted with three project managers from adopting organizations to determine elements of the ES adoption process. The following list of activities was developed:

- Regarding the requirements specification:
  - General requirements specification – understood as a list of enterprise areas and subareas that should be covered by the system.
  - Business process analysis – resulting in the business process model and/or description,
  - Detailed requirements specification – detailed list of system functions that should be implemented or other detailed requirement description.
- Regarding the information on system functionality:
  - Standard system presentation – during which a demo system is presented and (optionally) a discussion is led on possible configuration changes that would allow it to reflect the organization's requirements,
  - Dedicated system presentation – presentation of a prototype that includes solutions to a particular organization's business needs.

Two additional activities that could not be easily assigned to any of the above categories were identified:

- Hiring an external consultant (or consulting enterprise) to help with the selection process,
- Reference visit to see the system at work in a real-life setting.

A final result of the information gathering in all cases was a written offer, including scope, pricing and other contractual information.

Based on the above findings, a survey questionnaire was designed. A population for the survey was defined as 'the enterprises that made a major ES investment in the last 5 years in Poland'. As no official list of such enterprises is available, a search was made on the websites of Enterprise System providers and their implementing partners for reference. The 22 SAP, IFS, Oracle and Microsoft Dynamics vendors/implementing enterprises websites were analyzed. A query was also made among professionals from local consulting enterprises and doctoral studies candidates personally known to the author. The process identified 138 total enterprises. As the sampling procedure was based on searching the reference lists, all projects included in the sample were productive (i.e., no abandoned projects were included in the sample).

An e-mail questionnaire was sent to these enterprises with a cover letter requesting a response from a decision-maker on the project (project manager or steering committee member). A total of 28 enterprises responded to the survey, and most respondents (20 of 28) were the decision-makers in their projects, being either a sponsor, steering committee member or project manager. The other roles were team member (3), person not personally involved in

the project (3), free-lance consultant supporting the steering committee (1) and IT department specialist (1). The respondents were asked questions about the activities performed during the Enterprise System selection process. One questionnaire was unusable, as the enterprise did not have any influence on the system chosen.
Tables 3 and 4 show the activities performed during system selection together with the usage frequencies among the examined enterprises.

Table 3. Requirements gathering activities

Activity	Frequency	%
General requirements specification (list of functional areas and subareas of an ES system)	20	74.07
Business process analysis	17	62.96
Detailed requirements specification (detailed list of required system functions)	15	55.56

Source: Own elaboration

Table 4. System functionality information gathering activities

Activity	Frequency	%
Standard system functionality presentation	20	74.07
Dedicated system functionality presentation (including functionalities specific for the company	14	51.85

Source: Own elaboration

Additional aims of improving the information quality that cannot be assigned to any of the above categories were hiring a consultant to help with the selection process (44.44 %) and going for a reference visit to a company, where the system is already at work (14.81%).

The most common activities included general system specification and presenting the system's standard functionality. These are the easiest and least time/resource consuming activities, both for the adopting organization and potential vendors. However, making a valid decision based on such general information can lead to a misfit between organizational needs and system functionality. The informed decision should use a reasonable combination of the remaining methods. Table 5 shows the combinations that occurred in the sample.

Table 5. Information gathering activities

	No presentation	General presentation	Dedicated presentation	Sum	%
Processes, detailed requirements	1	2	8	11	40,74
Detailed requirements	1	2	1	4	14,81
Processes, general requirements	-	3	3	6	22,22
General requirements	1	3	2	6	22,22
Total	3	10	14		
%	11,11	37,04	51,85		

Source: Own elaboration

The above table indicates that almost any combination of methods appeared at least once. The most frequent choice for requirements gathering was performing the business process analysis, followed by the detailed requirements specification. This approach was chosen by 40.74% of the surveyed enterprises. The most frequent method of gaining knowledge about system functionality was the dedicated presentation, chosen by 51.85% of the enterprises subject to the survey. Almost 30% of surveyed enterprises used a combination of business process analysis and detailed requirements specification with a detailed system presentation as a preferred information gathering approach. Over 77% of surveyed enterprises used a structured approach to gather requirements. Assuming that this is a measure for the general

selection process evaluation, the answer to **RQ1** would be the following: 77.77 % of the surveyed enterprises used a methodological approach to system selection, with the 'complete' model consisting of the business processes analysis, detailed requirements specification and dedicated system presentation being the most frequent choices. This is consistent with the results of the survey made among Austrian organizations by Bernroider and Koch (2001).

4. Evaluation of the selection procedures

The second part of the study aims to confront the empirical evidence presented above with the expectations of professionals offering Enterprise System implementations to formulate guidelines for executing the selection procedure. Interviews were conducted with 3 professionals, who were responsible for offerings and implementations of Enterprise Systems in a medium-sized consulting enterprise. Table 6 shows the respondents' characteristics.

Table 6. Characteristics of respondents

Code	Main function	Approximate number of projects/offerings	Years of experience
Respondent 1 (R1)	President/sales	40	15
Respondent 2 (R2)	Project manager/sales	20	13
Respondent 3 (R3)	Sales/project manager	60	7

Open-ended questions were used during the interview. Each interview lasted from 30 minutes to an hour. The respondents were presented with the survey study results and asked to answer the following question:

'Provided that you are supposed to reply to a request for proposal regarding the implementation of an Enterprise System, which combination of the methods identified in the survey would allow you to prepare the least biased offer?'

Additional questions were asked during the interview to shed more light on why each method is suitable/unsuitable for a certain offering situation, what risks its usage presents for a future project and how it should be performed to allow an unbiased offer. The interviews were transcribed and coded according to the grounded theory coding techniques (Strauss and Corbin, 1998) with the use of the qualitative data analysis software - MAXQDA. Open coding was applied to identify the key aspects of the phenomenon. Strauss and Corbin (1998, p. 101) define open coding as: 'the analytic process through which concepts are identified and their properties and dimensions are discovered in data'. The identified and labeled concept is called a category. This was followed by axial coding to determine relationships between the formerly discovered categories. Axial coding aims to explain the phenomenon by answering the questions such as when, where, why, who, how and with what consequences. As a result of this process (Strauss and Corbin, 1998, p. 124) 'categories are related to their subcategories to form more precise and complete explanations of the phenomena'. The subcategories determine the conditions, actions/ interactions and consequences of the phenomena (Strauss and Corbin, 1998, p. 129).

Altogether 31 categories were identified during the open coding. The category that emerged from the data with highest frequency was **interaction** between the customer and the bidder (17 coded text segments) as the condition for preparing the unbiased offer. The two most frequent types of interaction were **workshop** (3 coded segments) and **presentation** (7 coded segments). Axial coding allowed to answer the question why interaction is so important during the system selection. It allows for requirements prioritization, refinement, and alignment with the system functionality. The following direct quotes from the interviews illustrate these findings:

R3: '[…] during a presentation you are able to collect/detail the requirements and determine if the customer is open for changes.'

R1: 'When you run a workshop, you can suggest to the customer the ways his/her problems would be solved and suggest which requirements are more important than others.'

On the other hand lack of interaction leads to several problems, such as lack of requirements prioritization, possible lack of requirements abstraction from the way the work is currently done, requirements misunderstanding between the customer and vendor. The following quotes illustrate that finding:

R1: '[…] the customer would then prepare a 'wish list' rather than a solid requirements document. There will be too many requirements. The customer employees quite often do not see an enterprise as a whole. The requirements will also be connected to the way the work is currently done.'

R2: 'If you get a written document, always some information is lost due to perception differences. Some of the information rest in your head and is not transferred to the written material. Furthermore, if someone else did the document, he/she could mean a different thing than you do while writing a certain sentence.'

The **type of system** was a category initially identified during open coding as the main determinant of the preferred approach to the system selection. However further analysis revealed, that behind the 'type of the system' there is a more general category, which determines the system selection approach, namely **system configurability** that can range from limited to high. The enterprise subject to the study offers two types of Enterprise Systems: the large 'all purpose' Enterprise Suite, offering vast configuration opportunities, and the 'industry specific' system, offering the best-of-breed solution for a specific industry and thus limited configurations.

For the highly configurable system all respondents stated that performing an **analysis workshop** is the best way to gather the requirements and present the possible solutions to the customer. This option was not identified during the survey study. It reflects the condition of interaction as the determinant of an unbiased offer. Axial coding allowed to assign subcategories to the workshop category, which shed light on its aims: to **define** the requirements, **prioritize** these, and **align** the requirements to the system functionality by discussing the possible solutions. It also prevents **information loss** during requirement codification and minimizes interpretation errors between parties. The prioritization and alignment is difficult to achieve when an offer is to be done on a basis of a ready requirements specification, without interaction with the customer.

Further analysis of the **presentation** category revealed that for the highly configurable system it can be done only after the requirements are known and incorporated into the system in a form of a prototype. Respondent 2 expressed this fact in the following words: '[…] there is no such a thing as 'standard' in this system so we cannot show anything reasonable to the customer. We need to have requirements to base on. We are not able to prepare a good offer if we do not have a detailed requirements specification.'

The additional questions were asked to determine the second-preferred approach, if the interaction in a form of a workshop with the customer is not possible. For the **highly configurable** system, the best solution is to use the complete model, including the **business process analysis, detailed requirements specification and dedicated presentation** (R1, R2, R3). All respondents emphasized the role of the business process analysis. It assures and allows verifying the requirements' completeness and prioritization, as well as their abstraction from the current practices. It also allows for elasticity in proposing the final solution, as the bidders can refer to the process itself and propose different solutions to those reflected in the requirements specification. At the same time, all respondents highly disregarded the **fast requirements model**, in which the requirements are identified without a prior business

processes analysis, as it does not grant the above. It also may lead to a 'wish list' with obsolete and low priority requirements and may thus impede the project scoping. Concerning system functionality information, R1 and R3 indicated the dedicated presentation as the preferred approach, as it assures the highest level of interaction between the customer and bidder. Respondent 2 raised the **budget constraint** issue for such an approach related to the highly configurable system, as performing such a presentation would require building a prototype. If the customer cannot afford it, a **standard presentation** with a **discussion** on possible configuration variants was proposed as an option. All respondents agreed that making an offer for a highly configurable system without detailed requirements would be difficult or an offer would be highly unreliable. The conclusion from the above discussion is that, for highly configurable systems, the **requirements driven approach** should be applied with the **complete model** being preferred.

Two respondents (R1 and R3) had experience with the industry-specific system that offers **limited configurability**. In this case, the customer must decide whether to buy the system on the 'take it or leave it' basis and adjust the processes to the system functionality, if needed. Respondent 1 explained this in the following words: 'This system leaves little space for configuration. It provides a standard solution for a certain industry. You either take it or not. So the preferable approach would be to make a system presentation and ask the customer, whether the system meets his/her requirements. You do not have to know much about the customer as you will not alter the system's functionality anyhow.' Performing the detailed requirements is thus not justified. Respondent 3 claimed, that for this kind of system it can even be harmful to the selection process as it compromises the customer's **elasticity**: 'If the customer has a detailed requirements specification, he/she is not open to any proposals to solve the problem in another way'.

Both respondents agreed that a **presentation model** should be used in this case. This includes the **dedicated or standard presentation**, preferably preceded by the business process analysis. The difference between the dedicated and standard presentations is indistinct in this case, as the system has few configuration options. However, the business process analysis allows focusing the presentation on the most important issues and customizing the presentation to the customer's needs. The **system functionality driven** approach is thus the best for a system offering limited configuration.

Regarding the form in which the processes and requirements should be presented, the respondents replied that processes should be presented in **graphical notation**, provided that it is relatively **simple** (R1, R2). The formal model should also be supplemented by the process **description** using **natural language** (R2), as people who are not accustomed to formal notations may have problems understanding them. Regarding the requirements specification, all respondents said that the natural language contractual style is sufficient for Enterprise System Selection. No respondent had ever used or observed any more formal notation for requirements specification.

The selective coding (Strauss and Corbin, 1998, p. 143-161) was performed to determine the central categories:

- **Level of system configurability**: ranging from limited to high – being the main determinant for the information gathering approach,
- **Information gathering approach**, with the following subcategories:
  - **requirements driven** – suitable for highly configurable systems,
  - **system functionality driven** – suitable for systems with limited configuration.
- **Interaction** - as a determinant of minimizing the offer bias,
- **Budget/time constraint** – as a limitation for interaction

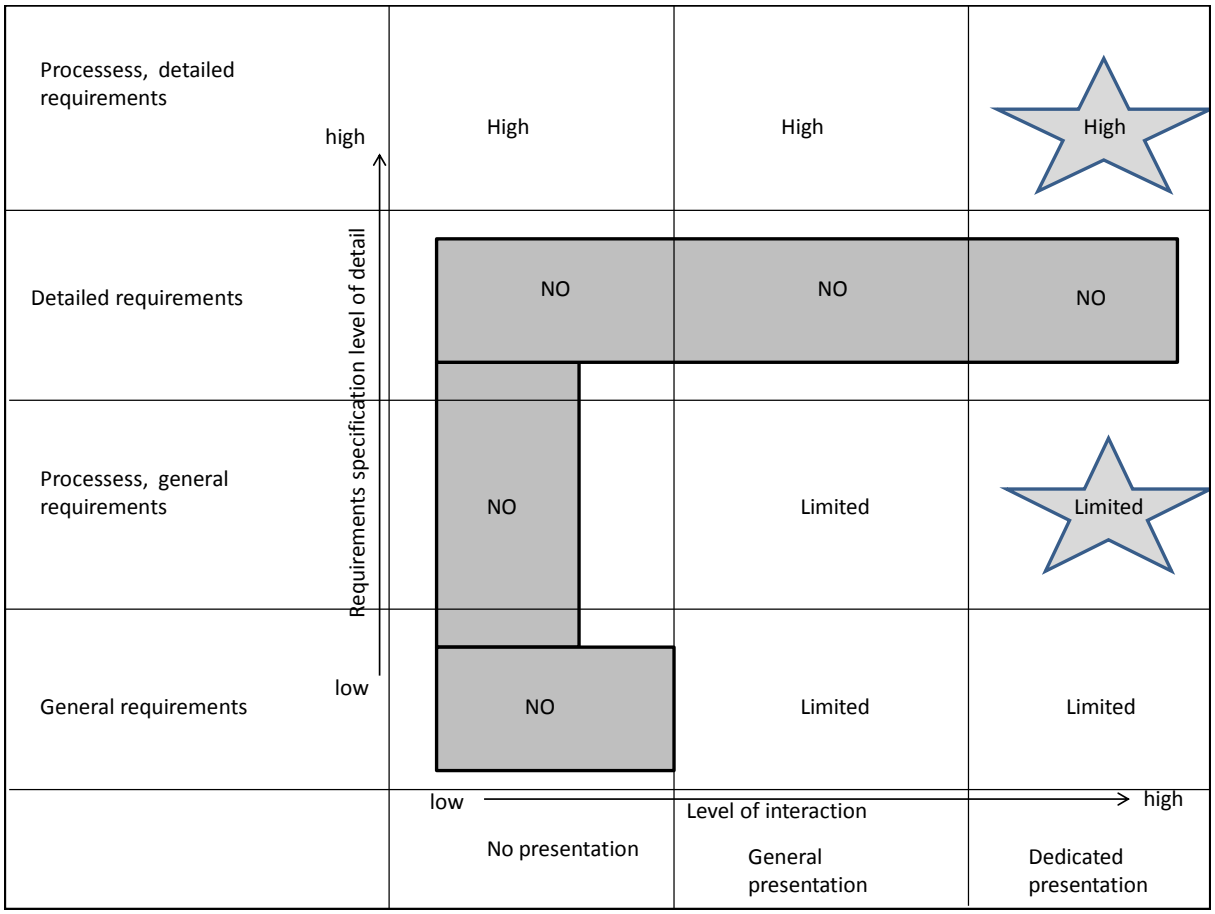
Building on these central categories, the following answers to **RQ2** can be formulated: The approach to information gathering during ES selection depends on the configurability level of the future system. For highly configurable systems, as for large 'all purpose' Enterprise Systems, a requirements driven approach should be applied. This approach starts by identifying the requirements of the adopting organization, which should be then confronted with the candidate systems' functionalities. The preferred approach to gathering requirements from the vendor's perspective is running a workshop, with the business process and requirements analysis. Such an approach guarantees that there is no information loss during the requirements codification and minimizes interpretation misunderstandings between the engaged parties. However, this approach requires a substantial budget and time/resources investment from the adopting organization, as the workshop should be repeated with each bidder and may thus be infeasible in most cases.

If so, the complete model should be applied for gathering requirements. This must include the business process analysis and detailed requirements specification. The processes should be presented graphically with simple notation and described using natural language. The requirements specification may be performed contractually, using natural language. The 'fast requirements model' that skips the business process analysis is not recommended, as it leads to requirements inconsistency, redundancy and a lack of prioritization. Regarding the system functionality information, more interaction between the customer and bidder is better. If the budget allows, it is beneficial to let the bidders prepare dedicated presentations, which equals the preparation of a simple prototype for highly configurable systems. If there is a budget constraint, a standard presentation followed by a discussion on the possible configuration options should be run instead. The requirements driven approach allows preparing an offer without these steps, based only on the requirements specification.

If the choice is between systems offering limited configurability, which would be the case for small- or industry-specific systems, the system functionality driven approach is more suitable. The starting point in this approach is the system functionality presentation, followed by the formal or informal 'fit-gap' analysis. The business process analysis allows better preparation of the system functionality presentation, but the detailed requirements specification is not required, as it limits customer elasticity and, due to the limited system configurability, the requirements that are not covered by the standard system functionality cannot be covered at all.

Figure 1 shows the matrix of the information gathering methods suitable for system selection, considering the system level of configurability (low/high).

Figure 1. Information gathering methods matrix



Regarding the business process model, graphical representation with simple notation, followed by the natural language description of each process was identified as the preferred approach. The contract-style natural language requirements specification was considered to be adequate, and no need was expressed for a more formal approach.

5. Conclusions

The aim of this paper was to explore the ES selection process with the stress on organizational needs and system functionality information gathering, and make indications for improvement of this process from the consulting enterprise (bidder) perspective. This perspective is scarce in the existing literature, so the paper fills a significant gap by presenting an evaluation of the existing selection approaches by the consulting experts.

The study conducted in this paper revealed that the information gathering approach should depend on the configurability of the systems subject to the selection procedure, a fact that is largely omitted in the existing literature. This paper contribution is manifested by stressing the inhomogeneity of the Enterprise Systems' population and the need to relate the selection approach to the specificity of the systems' subgroup being subject of selection. For highly configurable systems, to which category the 'all purpose' large Enterprise Suites can be assigned, the requirements driven approach should be applied. The preferred information gathering model is the 'complete' one, including a business process analysis, detailed requirements specification and dedicated system functionality presentation (prototype). If a budget does not allow for each bidder to prepare a prototype, the standard presentation, followed by a discussion on the possible configuration options, should be chosen. For systems

offering limited configurability, including industry-specific ones, the system functionality-oriented approach is most suitable. This approach is centered on the system presentation, and the requirements are gathered during this presentation on a 'gap-fit' basis. The identification of the preferred selection approaches may help the adopting enterprise to optimize the selection process and thus reduce the risk in that phase of the implementation project.

The next finding is the importance of interaction between the adopting organization and the bidder as the main determinant of minimizing the offer bias. The appropriate interaction was preferred over the sophisticated requirements engineering techniques, which supports the doubts raised by Daneva and Wieringa (2010) regarding the relevance of formal methods to Enterprise Systems requirements engineering.

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