Enterprise Systems Competencies – Supplying the Skills – The Novice Practitioner Perspective

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Abstract
The demand for enterprise systems skills is increasing persistent enterprise systems skill shortages. One explanation for the skills shortages is the gap between enterprise systems curricula in higher education institutions and the competencies expected from graduates by industry. A contemporary South African study identified interpersonal and business process competencies as key skills required by enterprise systems practitioners. Further studies identified and ranked business process practitioner competencies from the perspective of business. The current research extends these studies by examining the competency requirements identified by novice enterprise systems practitioners undertaking in-situ business process improvement assignments. Informing the study was the principle that competency acquisition is a combination of theory and practice intertwined through reflection. The findings show the importance of both business process competency and interpersonal competencies and confirm that these are global issues. The study contributes to the existing enterprise systems education body of knowledge in highlighting limitations in the transfer of technical competencies and identifying five specific technical competencies.

Keywords
Enterprise systems competencies, skills gap, theory-practice-reflection

Introduction
The shortage of skilled employees in the information and communication technology sector is cause for concern. Organizations investing in large cross-functional enterprise wide systems seeking to reduce costs and improve performance increase the demand for competent specialists (Mohamed & McLaren, 2009; Scholtz, Cilliers, & Calitz, 2012). This has resulted in a skills gap identified as the difference between the skills of graduates and the competencies required by industry (Scott, Alger, Pequeno, & Sessions, 2002). Competencies are multi-faceted and require a broader system of education and training geared to meeting the current and future needs of the labour market (Mansfield, 2004). A

Steyn, J., Van Belle, J.P. (Eds.). 2015. Beyond development. Time for a new ICT4D paradigm?
Proceedings of the 9th IDIA conference, IDIA2015, Nungwi, Zanzibar: 378-397
ISBN: 978-0-620-68395-1

competence-based education combines hard business-focused competencies and softer people-related skills (Andrews & Higson, 2008) which is applied in context (Le Deist & Winterton, 2005).

Enterprise systems are large, resource intensive and costly to operate making it difficult for higher education institutions to incorporate into their curricula and thereby extending the skills gap (Boyle, 2007). Furthermore, the success of enterprise systems has been debated, with reports of up to 70% of information systems (IS) projects failing with devastating losses (Cecez-Kecmanovic, Kautz, & Abrahall, 2014). Paradoxically, indications are that IS investments are increasing, leading to Cecez-Kecmanovic et al., (2014) positing a relational ontology which sees everything existing in relation to everything else. This overcomes the predominant view of success as being either objective or subjective and detrimental interactions can be moderated through reconfiguring actor-networks. For enterprise systems, configuring mechanisms are enacted by managing the business processes which are comprehended as key to business success (Bandara, Rosemann, Davies, & Tan, 2007; Ravesteyn, Batenburg, & de Waal, 2008; Seethamraju, 2012). Conversely, enterprise systems provide the foundation for managing business processes (Antonucci, Corbitt, Stewart, & Harris, 2004) and increase the demand for competent staff. With most success and failure studies focusing on implementation, few studies report on the on-going support required by enterprise systems. Although, research shows that business may occur only in the fourth or fifth years (Huang, Huang, Wu, & Lin, 2009), substantive proof of benefits is lacking and has been attributed to the lack of theoretical grounding (Trkman, 2010).

Although organizations expect business competencies from graduates (Bandara et al., 2007; Seymour, Scott, Malamoglou, Meyerowitz, & Morar, 2006) there remains a gap in understanding the appropriate competencies students need to be taught (Ravesteyn et al., 2008). Therefore, although the demand for business process practitioners has increased, the lack of understanding of required skills hampers business process educators in designing curricula that will adequately train graduates in business process skills (Bandara et al., 2007; Scott et al., 2002). Intensifying the issue is the need to balance theory and practice (Scholtz, Cilliers, & Calitz, 2011). This is further aggravated by the requirement of specialized technological knowledge typically taught in layers while business operates across functional layers (Nickerson, 2006). The result is vertical learning structures with little cross business discipline development (Grandzol & Ochs, 2010; Mohamed & McLaren, 2009).

In response to this situation, recent research has been undertaken to (i) identify competencies required by enterprise systems consultants (Scholtz et al., 2011), (ii) competencies required by business process analysts (Sonteya & Seymour, 2012) and (iii) business process analyst competencies demanded by industry (Chakabuda, Seymour, & Van Der Merwe, 2014). This research paper builds on these foundations by identifying a set of competencies from the reflections of the challenges and problems faced by novice business process practitioners.

The research seeks to answer the question – What skills and competencies did novice practitioners require during a business process improvement project in situ? The purpose of the study is to provide enterprise systems educators, hampered by the lack of clear

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requirements from business, with a set of competencies that will support curricula development.

In the next section theoretical underpinnings of the study are described followed by the research methodology and the research sample. Subsequent to this the research findings are presented and discussed prior to the conclusion.

Enterprise System Practitioner Competencies

With a lack of consensus on the definition of competence and competency (Jackson, 2009; Le Deist & Winterton, 2005) there remains no clear definition of what comprises competency. Sonteya and Seymour (2012:44) cite Mirabile (1997) to describe competency as the 'knowledge, skill, ability or characteristics associated with high performance on the job' which is similar to Ravesteyn et al.'s (2008) definition of required knowledge, skills, and attitudes of business process project members. Emphasis is placed on the need for multi-disciplinary education and the necessity to bridge the gap between theory and practice. Although hands on enterprise systems exercises are thought to bridge the theory-practice gap no evidence of the increase in the detailed knowledge of business processes has been observed (Rienzo & Han, 2010; Rienzo & Han, 2011). The need for a multi-disciplinary approach is encapsulated in the view that an enterprise system is a 'portfolio of management, technical, and organizational skills and expertise' (Stratman & Roth, 2002:602). While typical enterprise systems curricula cover technical skills, key soft skills are often neglected according to Mohamed and McLaren (2009) although both are important (Andrews & Higson, 2008).

In South Africa, Scholtz, Cilliers, and Calitz (2011) identified a set of 42 enterprise system competencies based on interviews with enterprise system consultants. The 42 competencies are summarized into 11 competency categories and 2 overarching competency groups. The overarching groups are supporting competencies – competencies that are generic to all information practitioners – and technical competencies – those competencies specific to enterprise systems. Soft and hard skills are evident in the model with Interpersonal competencies ranked #1 and supporting business competencies ranked #2. Four technical competencies follow – business process management (#3), ERP implementation and configuration (#4), ERP transactions (#5), ERP management (#6) – supported by general management (#7) and information systems (#8), ERP theory and concepts (#9), ERP security (#10), and programming (#11). The most significant competency requirements for enterprise system consultants are soft skills followed by business knowledge and business processes competencies.

Business processes are posited as pivotal for business process analysts (Sonteya & Seymour, 2012), are functionally based on the role of business analyst and require a combination of technical, business and interpersonal skills. Figure 1 presents Sonteya and Seymour's (2012) 16-competency, 5 level business process analyst competency framework. This is established on business analyst fundamentals, rising through business interpersonal competency, organizational knowledge, and business process orchestration to culminate in technical competency.

Business Process Analyst Competency Pyramid

- SS Level 1. Business process analyst fundamental competency
    - The business process analyst competence builds on traditional business analyst positions, and includes the ability to see business processes holistically, be client-facing, and have the ability to use mathematical and statistical skills to improve business processes.
- SS Level 2. Business interpersonal competency
    - Business interpersonal competencies are essential in understanding and communicating processes between all levels of the organization while building relationships.
- SS Level 3. Organizational knowledge
    - Organizational knowledge competencies are essential for understanding how business processes are related to and enact organizational strategy.
- SS Level 4. Business process orchestration competency
    - Business process orchestration competency is the pivotal amalgamation of the lower levels requiring the ability to model business processes, design improved processes, and identify potential risks within business processes.
- SS Level 5. Technical competency
    - Technical competency is reliant on contemporary technology and therefore less generic than the other competencies. Yet it remains important for the practitioner to understand how the business processes impact the underlying technology.

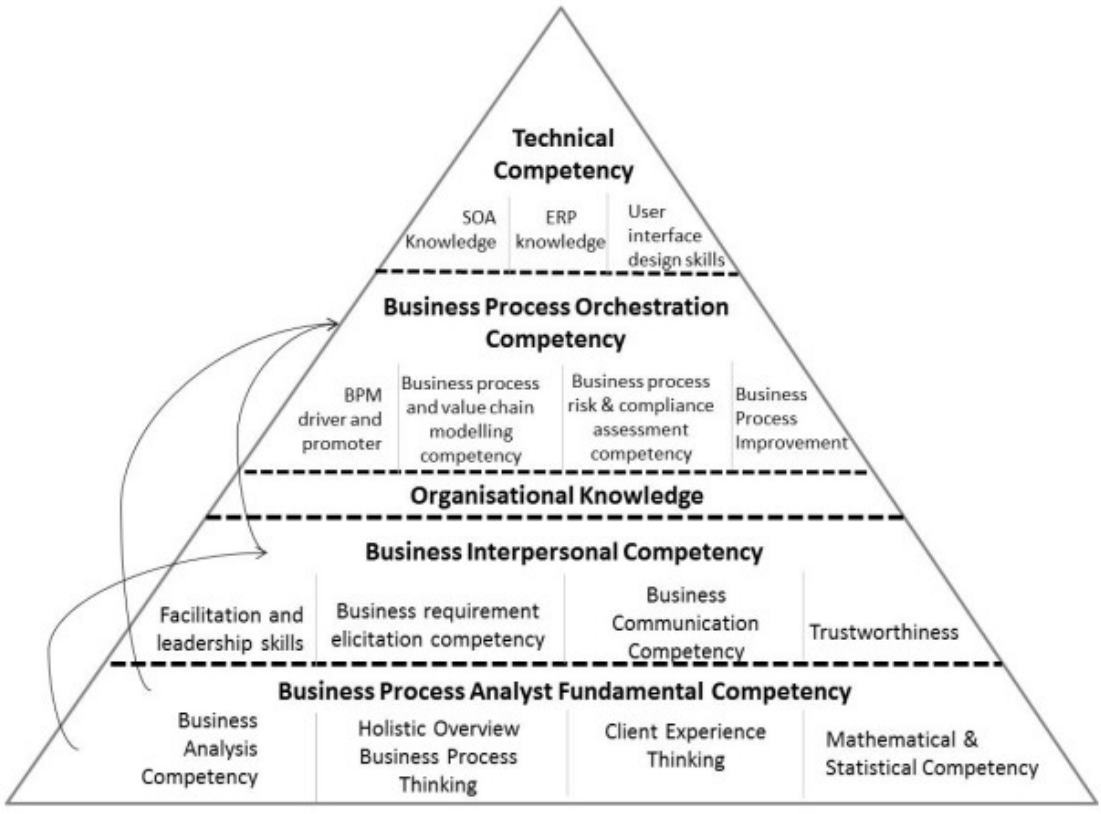

Figure 1. Business Process Analyst Competency Pyramid (Sonteya & Seymour, 2012).

Chakabuda, Seymour, and Van Der Merwe, (2014) used the Sonteya-Seymour

competency framework (SS) to examine gaps between employers' expectations and their perception of the competencies of a group of novice business process analysts. They observed business interpersonal competency (SS Level 2) to be most important to employers, followed by organizational knowledge (SS Level 3), business process analysis fundamental competency (SS Level 1), business process orchestration competency (SS Level 4), and lastly technical competency (SS Level 5). They found that graduates have the requisite skills but have not acquired the competencies to the level desired by employers.

Competencies Acquisition

Experiential learning which is increasingly used for transferring knowledge from educational institutions to students (O'Sullivan, Goldensohn, & Hinton, 2014) is particularly effective in African societies (Gyimah-Brempong & Ondiege, 2011). Experiential learning is the creation of knowledge from experience (O'Sullivan et al., 2014) by combining theory and practice through reflection for improved learning (Raelin, 2007). The experiential process seeks to overcome the separation of formal educational institutions (theory) from the world of work (practice) found in industrialized nations (Roth, Mavin, & Dekker, 2014). Authors have posited various explanations of the knowledge gap, such as Van de Ven and Johnson (2006) who describe three ways of framing the theory practice gap. Firstly, as a knowledge transfer problem which views theory and practice as essentially the same concept, simply requiring a better knowledge transfer mechanism between the two. The second view regards theory and practice as complementary concepts, while the third view builds on the second to suggest the use of economic-style arbitrage to mediate between theory and practice.

Although much has been learned from literature dedicated to knowledge transfer between educational institutions and industry, the economic benefits have not been realized (Agrawal, 2001). Agrawal separates knowledge transfer literature into four categories. Absorptive capacity of the firm is seen as a pull mechanism with a push mechanism from universities as a second category. The third category sees tacit knowledge spilling-over into surrounding geographic regions. Finally, knowledge is channeled through patents, publications, faculty consulting and graduate placements. Although faculty and graduates are mentioned, the four categories are fundamentally structural in nature and ignore the agency of graduates and faculty as addressed in experiential learning.

Taking a pragmatic stance, Raelin (2007) incorporates practice into knowledge building within the Outcomes of Practice-Based Learning model which seeks to overcome the separation of theory from practice. The model advocates dialogical interaction between theoretical conceptual models and norms and conventions from practice. The main purpose of theory is to inform practice which is weakened when not informed through reflection. The outcome of practice-based learning is anticipated to produce four learner benefits through using experience to engage, extend, and create knowledge.

- Academic development – provides motivation for increased learning both generally and specifically in subjective areas. Students may be encouraged in particular topics and have the ability to put the learned theories into practice
- Personal development – this encompasses personal and social growth and includes soft skills such as: empathetic listening; relationship building; ethics; making informed decisions; responsibility; initiative; and recognizing multiple perspectives.

- Career development – this represents vocational choices and career decision, quality of employment position, and career progress.
- Work skills development - these are linked to personal development within career development and comprise technical knowing-how and social abilities including the capacity to understand and effect culture changes.

The goal of the model is to facilitate dynamic learning rather than imparting knowledge. Raelin (2007) calls for partnerships between theorists and practitioners for knowledge production and dissemination through three 'building blocks': Tacit Knowledge; Mastery; and Critical Reflection.

Tacit Knowledge

- Tacit knowledge is embedded in practice and difficult to articulate. It represents 'knowing-how' and uses many experiences to construct a form of theory over time. Work skills development - these are linked to personal development within career development and comprise technical knowing-how and social abilities including the capacity to understand and effect culture changes.

Mastery

- The development of tacit knowledge in different contexts enables experts to adapt to daily problems by drawing on previous experience and proven theories. Using reflection, theories are extended and differentiate the expert-master from the apprentice who must rigidly follow predetermined situation-specific theories. Masters tend not to observe objective reality but construct new ways of thinking for each job thus embedding mastery in practice.

Critical Reflection

- In developing tacit knowledge practitioners will reflect on what worked in different situations, often in conjunction with others thus leading to shared understandings. According to Raelin (2007), the root praxis incorporates not only one's practice, but thinking about that practice and the practice of others. The inclusion of others infers a critical aspect in order to ascertain if some stakeholders are privileged at the expense of others. Critical thinking seeks to improve intuition (tacit knowledge) thus critical reflection links tacit knowledge and mastery as well as theory and practice.

However, assessment of the outcome of the model is problematic. Raelin (2007) criticizes the Western tendency of assessing knowledge through measurement. The tacit nature of practice and contextual theory formulation demands assessments in context which are typically temporally and spatially limited. Assessments are best aligned to the work itself and judged by the practitioner (using self-reflection and self-assessment). Recognizing the critical nature of reflection and grounding in practice, Raelin advocates a reflective practice of documenting outcomes of practice in problem intervention so as to capture what was learned, how it was learned, how much was learned, and why it was learned.

How do Novice Practitioners Experience the Acquisition of Competencies?

Employers persistently demand industry relevant skills from graduates different to that which universities are providing. While technical skills are observed to be moderately important, communication soft skill is one of the most lacking general employability skills

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according to Chavan and Surve (2014). Likewise verbal communication, self-motivation, teamwork and goal directedness are seen to be as important as technical skills (Pop & Barkhuizen, 2010) and are also considered important in enterprise systems education (Boyle & Strong, 2006; Mohamed & McLaren, 2009). Hamilton, Carbone, Gonsalvez, and Jollands (2015) suggest that soft skills precede business acumen and technical ability. Meanwhile, the challenge for higher education institutions is to maintain education standards (Bennis & O'Toole, 2005) while supplying skills demanded by industry.

According to Dacre Pool and Sewell (2007), overall employability is a multi-level construct with hard and soft skills linked through reflection and evaluation. Hard and soft skills are regarded as beneficial to employability (Jaeger, Rudra, Aitken, Chang, & Helgheim, 2011; Scott & Wilson, 2002) and a crucial part of active learning (Prince, 2004). Enterprise system courses offered by universities frequently use active or experiential leaning by including hands-on training or projects. However enterprise systems are too complex to be totally autonomous and necessitate supervision (Winkelmann & Leyh, 2010) requiring a balance between instruction and application (Kirschner, Sweller, & Clark, 2006).

In order to answer the question of what competencies novice enterprise systems practitioners gained through experiential learning, a general inductive study was undertaken from the articulated reflections of two groups of students at a university in South Africa. The two groups undertook a variety of business process improvement projects in multiple organizations and industries subsequent to enterprise systems and business process education as discussed below.

Research Methodology

The research took the form of a general inductive approach deemed suitable for identifying emergent themes inherent in raw data that may be obscured or remain hidden due to restraints imposed by structured methodologies (Thomas, 2006). The research process was initiated by the educational facility in determining what they believe students should be taught in order to prepare them as business process practitioners. Part of the course required students to do a business process work assignment in a real-life situation. A learnings section of each work assignment returned by the students was reviewed and coded following Thomas' general inductive approach with the aid of the TAMS Analyzer (version 4.14) software. The coded passages were then re-reviewed and classified into categories.

As the 10 undergraduate level assignments were undertaken at the university no further approval was needed for their inclusion. The graduate level required approval for inclusion due to the assignments being undertaken outside of the university. Seventeen graduate approvals were obtained of which 3 were excluded as they contained no learning section. This resulted in a total of 24 projects being included in the study.

Course Outline

The graduate course is offered as a one year part time course for students already in the market place. The course extends to a second year for either a Post Graduate Diploma or by invitation to an IS Honours degree. The course objective was to expose students to, and encourage them to apply the principles and practices of business process

management, enterprise systems, and business process integration. The third year undergraduate full-time course focused on enterprise systems and business processes with the aim of providing students with an understanding of the relationships between information technology applications and business.

Both of the courses included subject matter that supports business processes and included information systems strategy, strategic use of information and communication technology, knowledge management, business intelligence, and project management. The enterprise systems component included management and lifecycle of enterprise systems, fundamental training in using enterprise systems and the bi-directional relationship of business processes and enterprise systems.

The courses provided general awareness of practices, trends and risks associated with information technology application, acquisition, implementation and usage. Core business processes including sales, purchasing, materials management, accounting and human resources functions were introduced. Part of the teaching was an understanding of the support, integration, and improvement of business processes and the role that information systems professionals play in business process management. The lessons were supported by hands-on training in the SAP enterprise system and in process modeling combined with real-life case studies and a work assignment that offered students the opportunity to apply their knowledge of business processes in practical situations. At undergraduate level, the work assignments were performed in teams, and individually at the graduate level.

Business Process Work Assignment

The business process work assignment required the preparation of a document for presentation to management requesting permission to proceed with either the implementation, or upgrade to an existing implementation of an enterprise system of the students' choice. The document was required to follow the BPTrends (www.BPTrends.com) business process methodology and include a scoping diagram, stakeholder analysis and a business case. The analysis phase took the form of an As-Is diagram and a To-Be diagram for the design phase. Process improvements were to be detailed and metrics determined to ensure that the improvements are realized after implementation. An enterprise system was to be selected and activity worksheets detailing the process steps, organizational data, and master data were to be produced for each primary activity, together with screenshots and example reports. As part of the assignment, the students were required to include a section on the lessons learned during the assignment. These learnings form the basis of the research for this paper.

The course content corresponds to Raelin's (2007) theory construct while the work assignment represents the practical component and the learnings review represents the reflection element.

Business Process Competence Findings

The student work assignments were performed over a range of industries and business processes as shown in Table 1. The undergraduate projects were limited to processes

within the University which accounts for the number of assignments in the education industry ranking. Open coding through reading and grouping similar concepts in the students' learning sections produced 16 coded concepts from a total of 201 coded data sections. These 16 codes were summarized into 5 categories. The coded categories and conceptual codes are listed in Table 2 together with the number of references to each concept and category.

Industry	Process	Projects
Agriculture	Procure	1
Education	Cash Management	1
	Compensation Management	5
	Procure to Pay	4
	Total	10
Engineering	Design to Release	1
Financial	Asset Acquisition to Dispose	1
	Recruiting	1
	Total	2
Government	IT Development	1
Insurance	Insurance Claims	1
	Lead to Order	1
	Workforce Development	2
	Total	4
Media	Lead to Order	1
Mining	Procure to Pay	1
Petro-Chemical	Asset Acquisition to Dispose	1
	Workforce Deployment	1
	Total	2
Retail	Procure to Pay	1
Count: 24		

Table 1. Project count by industry and business process

Ranking	Category	Total	Graduates	Undergraduates
1	Stakeholder Collaboration	63	38	25
1.1	- Stakeholder Interest	34	25	9
1.2	- Appropriate Questioning	11	4	7
1.3	- Appropriate Stakeholder Selection	8	1	7
1.4	- Top Management Support	6	5	1
1.5	- Change Management	4	3	1
2	Business Process Understanding	50	31	19
2.1	- Process Understanding	40	23	17
2.2	- Business Process Improvement	10	8	2
3	Technical Complexities	36	23	13
3.1	- Enterprise Systems Knowledge	24	18	6
3.2	- Business Process Method Knowledge	8	5	3
3.3	- Key Performance Indicators Metric Determination	4		4
4	Team Dynamics	27	2	25
4.1	- Team Communication	15	2	13
4.2	- Team Mix	6		6
4.3	- Team Building	4		4

4.4	- Team Leader	2		2
5	Project Management	25	11	14
5.1	- Project Management	15	7	8
5.2	- Time Management	10	4	6
	Total coded sections	201	105	96

Table 2. Ranking of students learnings.

As shown in Table 2, the most significant concepts are process understanding (n=40, 20% of total coded sections), followed by stakeholder interest (n=34, 17%), and enterprise systems knowledge (n-24, 12%). The five categories in order of significance are: stakeholder collaboration (n=63); business process understanding (n=50); technical complexities (n=36); team dynamics (n=27); and project management (n=25).

During the coding process commonalities were observed between the five categories and the key skills that organizations expect of enterprise systems graduates defined by Boyle and Strong (2006). The primary difference is observed in the area of soft skills. Boyle and Strong's (2006) interpersonal skills requirement focuses on the ability of the practitioner in communicating with others whereas stakeholder collaboration in this study concerns interaction between people. Although largely missing from Boyle and Strong's (2006) study, stakeholder collaboration is strongly represented in the findings of the current study.

1. Stakeholder Collaboration

Themes related to social interaction between the novice practitioner and the organization were categorized as Stakeholder Collaboration. This is expressed as stakeholder interest, appropriate questioning, appropriate stakeholder selection, top management support, and change management. This competency corresponds to Scholtz et al.'s (2011) highest category Interpersonal competency (#1), and to Business Interpersonal Competency which is Chakabuda et al.'s (2014) highest competency group, and Sonteya and Seymour's (2012) second highest.

1.1 Stakeholder Interest

Overall, stakeholder interest is the second most documented issue and reflects the interest shown by stakeholders in the project, in particular the difficulties in setting meetings with relevant stakeholders. Problems encountered included the reluctance of stakeholders to make time for interviews, lack of interest in the proposed projects, and resistance to potential changes. In limited cases even animosity towards the individual business process analyst was recorded. Some students also suggested that additional stakeholders should have been interviewed which may have had an impact on the understanding of the relevant processes.

> "Setting up meetings with key stakeholders proved challenging and time consuming" (Graduate student A)
>
> "... resistance from certain employees providing answers to my questions" (Graduate student K)
>
> "… staff members become very defensive and seemed to feel threatened when we started interviewing them. This is something that we were taught to expect but being confronted with the situation and trying to get past the defensive wall was much more difficult than we

expected" (Undergraduate team F)

1.2 Appropriate Questioning

Many students indicated that appropriate questions should have been prepared prior to the interviews. Some students stressed the need for listening skills and professionalism.

> "… put more effort in designing a questionnaire or other tool that would make the requirements gathering more fruitful" (Graduate student C)
>
> "… asking the right questions to obtain the best or most appropriate information was difficult." (Undergraduate team B)
>
> "… structure our questions in a manner that is more understandable to those we will be interviewing" (Undergraduate team G)

1.3 Appropriate Stakeholder Selection

Stakeholder interest and process understanding issues resulted from the selection of either too few stakeholders or stakeholders with limited knowledge and power. Appropriate stakeholder selection includes both the quantity and the quality, in the form of interest and knowledge, of the stakeholders.

> "… followed by stakeholder identification and analysis procedure to determine the levels of influence of each stakeholder especially in the determination of dominant stakeholders." (Graduate student D)
>
> "… ensure that we speak to a stakeholder who understands our whole process, if possible, and get down all the necessary stakeholders so that things do not have to be changed later" (Undergraduate team C)
>
> "… taught us to identify who the key stakeholders are and how to get information from these people" (Undergraduate team G)

1.4 Top Management Support

Although top management support is recognized as the top critical success factor for business process projects (Trkman, 2010), few of the students noted this as a learning.

> "… importance of top management support." (Graduate student G)
>
> "Management support is key" (Graduate student J)
>
> "… learned that stakeholder management's support is an important ingredient to success of any project" (Undergraduate team E)

1.5 Change Management

Change management issues were closely associated with stakeholder resistance.

> "Change management is crucial" (Graduate student J)
>
> "The change control process is an important part of business. If change is not managed there's a lot of risk" (Graduate student N)
>
> "… often the people that hold the process back and do not want to change" (Undergraduate team C)

2. Business Process Understanding

Business process understanding issues incorporate both the understanding of business processes and the understanding of business process improvement. This competency corresponds to Scholtz et al.'s (2011) third category Business Process Competency (#3), and to a lesser extent to Business Competency (#2), ERP Implementation and Configuration (#4), ERP Management Competency (#6) and Information Systems Competency (#8). Further it relates to Chakabuda et al.'s (2014) Business Process Analyst Fundamental Competency (level 3 – Sonteya and Seymour's (2012) level 1) together with Organisation Knowledge Competency (level 2 – Sonteya and Seymour's (2012) level 3), and Business Process Orchestration Competency (level 4 – Sonteya and Seymour's (2012) level 4).

2.1 Process Understanding

Process understanding was the most significant issue reported overall incorporating lack of understanding of business processes from both interviewers and interviewees. Students encountered difficulties in understanding both the concept of business processes and the scope of the specific process under investigation, while stakeholders either did not fully explain the process or were unaware of the role that they perform within a given process. Some students appear to understand business process and enterprise systems as inflexible and tried to match the enterprise system to their business process.

> "… ensuring that we understand what it is exactly that we need to do i.e. understanding the business process clearly" (Undergraduate team D)
>
> "… in completing our business process, we found that no-one quite knew what the process was ..." (Undergraduate team D)
>
> "… learned was that the sponsor's idea or perspective on the project may be totally different to how you are thinking about it …" (Undergraduate team H)
>
> "… biggest challenge experienced would definitely be the identification of the ERP that would fit the process " (Graduate student E)

2.2 Business Process Improvement

Business process improvement was observed to be more difficult in practice than what the theory expounds.

> "We also realised that these improvements are easier said than done" (Undergraduate team C)
>
> "Coming up with a To-Be process was also very challenging as there where many alternatives and options to solving the problems and trying to select the best solution that would provide the business with a competitive edge was difficult" (Graduate student C)
>
> "… improving a business process is an iterative exercise, when making big changes you tend to lose sight of the original problem " (Graduate student F)

3. Technical Complexities

For this study, technical complexities represent elements of technical knowledge, technical management knowledge, and business functional knowledge. This competency

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corresponds to Scholtz et al.'s (2011) third category Business Process Competency (#3), and to a lesser extent to Interpersonal Competency (#1), ERP Transactions (#5), ERP Management Competency (#6) and Information Systems Competency (#8). Further it relates to Chakabuda et al.'s (2014) Technical Competency (level 5 – Sonteya and Seymour's (2012) level 5) together with Business Process Orientation Competency (level 4 – Sonteya and Seymour's (2012) level 4), and Organisation Knowledge Competency (level 2 – Sonteya and Seymour's (2012) level 3).

3.1 Enterprise Systems Knowledge

The third most frequently cited issue was the lack of understanding of enterprise systems. Students believed their work assignment to be hampered by either a lack of understanding of enterprise systems or the need for more experience with these systems.

> "… spend more time understanding SAP and working on many SAP examples of processes " (Graduate student C)
>
> "The team members would work together to figure out how to use SAP ERP effectively" (Undergraduate team A)

3.2 Business Process Management Method Knowledge

Corresponding to the observed need to increase enterprise systems knowledge, business process methodology and modeling skills were deemed inadequate.

> "… using BPMN notation proved a steep learning curve. I found the tools at my disposal complex and difficult to understand" (Graduate student A)
>
> "… little to no experience first of all in the Business Process Modelling practice" (Undergraduate team B)
>
> "Another aspect we learned was business process analysis." (Undergraduate team G)

3.3 Key Performance Indicator Metric Determination

The skill to determine of Key Performance Indicators and metrics were deemed limited.

> "… big issue that we had was to get the baseline measurements for our system." (Undergraduate team C)
>
> "… make sure that we can get hold of some important baseline measurements up front" (Undergraduate team C)

4. Team Dynamics

Team dynamics incorporates the complexities of interactions within the team, such as communication, the mix of skills, team building, and the need for a leader. This competency corresponds to Scholtz et al.'s (2011) primary category Interpersonal Competency (#1), as well as to Chakabuda et al.'s (2014) first level Business Interpersonal Orientation Competency (level 1 – Sonteya and Seymour's (2012) level 2).

4.1 Team Communication

Intra-group communications accounted for the majority of team issues by the undergraduate students.

"If one person does not take part in the meetings or workshops, the project is bound to fail." (Undergraduate team A)

"The unexpected disappearance of [..*name*..] placed a lot of pressure on the team as well as creating a lot of animosity and resentment towards him" (Undergraduate team F)

"Motivated people and contacted people to come to the meetings by using every communication tool we have at our disposal" (Undergraduate team J)

4.2 Team Mix

The undergraduate teams comprised members from two similar yet different sub-disciplines of IT, namely Information Systems students (representing the business aspect) and the Computer Science students (representing the technical aspect). The dynamics of these mixed teams accounted for the second most common team issue.

"Gained knowledge of how to work efficiently with Computer Science and Information System students in one group" (Undergraduate team A)

"… it was a bit tricky meeting up and communicating between the IS and Computer Science members of the team" (Undergraduate team C)

"Information Systems' students being paired up with Computer Science students and this in itself was a major discomfort for everyone" (Undergraduate team D)

4.3 Team Building

Teamwork skills enhancement was also recorded by the groups.

"As soon as some members were struggling to understand the current process the rest of the team was always there trying to meet and to explain unclear moments" (Undergraduate team E)

"This experience did however bring the team closer together" (Undergraduate team F)

"… assisted us in developing our teamwork skills" (Undergraduate team G)

4.4 Team Leader

Two teams noted that they derived benefit from the selection of a team leader to act as project manager and to motivate the team members.

"… appropriate team leader to manage a project successfully. The team leader was used to motivated the team members and setting up meetings." (Undergraduate team A)

"… simplified by selecting a group leader to handle delegation and division of work" (Undergraduate team B)

5. Project Management

The project management category includes time management and other general issues relating to the management of projects. This competency corresponds to Scholtz et al.'s (2011) General Management Competency (#1), and to Chakabuda et al.'s (2014) first level Business Interpersonal Orientation Competency (level 1 – Sonteya and Seymour's (2012) level 2).

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ISBN: 978-0-620-68395-1

5.1 Project Management

Project management is a recognized critical success factor in business process improvement projects (Stratman & Roth, 2002). It is effective in ensuring that the objectives of a project are accomplished by directing and supervising the activities of the business process intervention.

> "I would spend more time reading up on project management in order to get a grasp on how to come up with a project plan and how to draft a business case." (Graduate student C)
>
> "Another issue that arose was the division or delegation of work for the various deliverables during the course of the project." (Undergraduate team B)
>
> "… delegating tasks and getting them done to help in the development of our documentation" (Undergraduate team I)

5.2 Time Management

Students remarked on the need for careful time management and in particular the need to start a project as early as possible. Starting a project early was linked to appropriate stakeholder selection and appropriate questioning as well as to research into the specific business, the business processes to be reviewed, and the enterprise system to be employed.

> "… bed down the topic from day 1 and start setting up appointments as early as possible" (Graduate student A)
>
> "… start the ball rolling far sooner" (Undergraduate team B)
>
> "What helped a lot with this problem was meeting the sponsors early so that if there are questions, there is always time for another sponsor's meeting to further clarify ideas about the project." (Undergraduate team H)

Discussion of the Findings

This study was based on enterprise systems competence in contrast to competency. Competence denotes knowledge and skills that individuals require in order to perform at a competent level whereas competency refers to the underpinning behaviour of the individual (Le Deist & Winterton, 2005). The research findings confirm that interpersonal and business processes competencies are of paramount importance for novice enterprise practitioners, confirming the findings of Scholtz et al. (2011), Sonteya and Seymour (2012), and Chakabuda et al. (2014) respectively. Except in the area of interpersonal skills this study correlated to the key skills that organizations expect of enterprise systems graduates as defined by Boyle and Strong (2006). This finding is significant in two regards. Firstly, interpersonal skills differ considerably between the requirements of business (Boyle and Strong's perspective) and that experienced by practitioners (this study's perspective). Secondly, this study which was based on *a priori* inductive qualitative approach within a small sample localized in South Africa obtained similar results to a significantly larger international study based on a positivist deductive survey.

In contrast to Scholtz et al.'s (2011) inclusion of team issues as a sub-item of Interpersonal Competency, team dynamics were treated separately in this study and proved to be a key topic even though less than half of the respondents experienced working in a team.

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Similarly, project management ranked comparably within this study and that of Scholtz et al. (2011) although it is not directly reflected in the other models.

The study confirms that knowledge transfer does not take place adequately in the classroom. Although education may appear to be sufficient, it is found to be lacking once the theory is put into practice, confirming the thinking that theory and practice needs to be linked more closely. For enterprise systems this requires that theory and methods be learnt from both a business and a technical perspective (Van de Ven & Johnson, 2006) and integrated with a practical component (Ravesteyn & Versendaal, 2010). In a Dutch study similar to this one Ravesteyn and Versendaal (2010) identified three primary issues: complexity of stakeholder collaboration, technical complexities, and team dynamics, but failed to address the soft-skills regarding sociological aspects in dealing with stakeholders and team dynamics. Soft skills are shown to be of primary importance for enterprise systems practitioners (Scholtz et al., 2011) and whereas some competency frameworks include soft skills (Boyle & Strong, 2006; Mohamed & McLaren, 2009; Peslak, 2005) others ignore them (Stratman & Roth, 2002).

The high ranking of technical knowledge however indicates that novice enterprise system practitioners lack the required technical competencies. Whereas this could be attributed to the very nature of being novices the specific competencies lacking may require further investigation. The most significant issue reported by novices was the lack of process understanding. Their difficulties appeared to stem from a lack of organizational knowledge which was not specifically identified in this study even though it was at level 2 in Chakabuda et al.'s (2014) framework. This may serve to explain their impression that stakeholders could or would not explain the existing processes. Taken together with the call for more enterprise system experience, this may also explain the observation of organizational business processes appearing to be inflexibly linked to the enterprise system. Another area lacking understanding was business process improvement. The novices encountered difficulties in following the process improvement methodology, in modeling business process, and in determining key performance indicators and metrics. Further research is required to understand how to provide the required technical expertise. Options include further education, practical training (though typically product specific), more case studies, and practical in-situ work assignments.

Conclusion

This paper set out to determine the basic competencies required of enterprise systems practitioners by investigating the learnings of students actively involved in an enterprise system-business process management project. The purpose of the study is to support curricula development of educational faculties who are hampered by the dichotomy of needing to know what to teach business students and the lack of clear requirements from business.

The study found that stakeholder collaboration and the understanding of business processes were the most significant issues faced by the students from both undergraduate and graduate courses, followed closely by technical knowledge issues and team

dynamics. Similarities were observed between the issues facing South African novice enterprise systems practitioners and educators and international equivalents in the studies of Boyle and Strong (2006) and Ravesteyn and Versendaal (2010).

The implication for educational faculties is that insufficient transfer of knowledge is taking place in the classroom thereby highlighting the need for the practical application of theories and methods. While university courses are designed to provide the communication skills required by Boyle & Strong (2006) specific technical skills development needs are identified in this study. The novices discerned five specific technical needs. These needs are firstly, general business process understanding and indirectly the need for organizational knowledge. Secondly, better knowledge of enterprise systems and the associated integration with business processes. Thirdly, to better understand business process improvement methodologies. Fourthly, to better understand business process modeling and lastly, knowledge and experience to determine and apply key performance indicators and metrics.

Limitations and Contribution to Knowledge

In view of the fact the students were not supplied with guidelines as to the structure of the learning section of the assignment, the outcome was not unduly influenced, however this may have limited the breadth of the findings with students only reporting areas where obvious issues occurred. A further limit is the relatively small size of the sample (24 respondents) emanating from a single education institution. In view of the fact that the research exhibits findings in common with two larger and unrelated international projects the relevancy of the topic and this research is demonstrated.

Although the course content favoured the technical aspects of enterprise systems, challenges were identified in the knowledge transfer of the curricula which indicates the requirement for further research into effective enterprise systems education.

The paper contributes to the field of enterprise systems education by emphasizing the importance of soft skills education and providing a checklist of five vital technical competencies necessitating improved knowledge transfer.

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