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A Critical Analysis of Business Process Management Education and Alignment with Industry Demand: An Australian Perspective

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A Critical Analysis of Business Process Management Education and Alignment with Industry Demand: An Australian Perspective

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Abstract:

Business Process Management (BPM) is accepted globally as an organizational approach to enhance productivity and drive cost efficiencies. Studies confirm a shortage of BPM skilled professionals with limited opportunities to develop the required BPM expertise. This study investigates this gap starting from a critical analysis of BPM courses offered by Australian universities and training institutions. These courses were analyzed and mapped against a leading BPM capability framework to determine how well current BPM education and training offerings in Australia address the core capabilities required by BPM professionals globally. To determine the BPM skill-sets sought by industry, online recruitment advertisements were collated, analyzed, and mapped against this BPM capability framework. The outcomes provide a detailed overview on the alignment of available BPM education/training and industry demand. These insights are useful for BPM professionals and their employers to build awareness of the BPM capabilities required for a BPM mature organization. Universities and other training institutions will benefit from these results by understanding where demand is, where the gaps are, and what other BPM education providers are supplying. This structured comparison method could continue to provide a common ground for future discussion across university-industry boundaries and continuous alignment of their respective practices.

Keywords: business process management; BPM education; BPM capabilities; content analysis; NVivo

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I. INTRODUCTION

Business Process Management (BPM) is a set of structured methods and technologies for managing business processes [ABPMP, 2009]. "The goal of BPM is to create a process-centric, customer-focused organization that integrates management, people, process and technology for both operational and strategic improvement" [Goeke and Antonucci, 2011]. BPM encompasses methodologies for process change (such as business process improvement (BPI), business process reengineering (BPR), and Six Sigma initiatives), overall management approaches (for building and managing process-related organizational capabilities, standards and notations), and tools and technologies (such as BPM systems [BPMS], Enterprise Systems [ES]), and tools for process modeling and simulation [Antonucci and Goeke, 2011; Bandara et al., 2010].

BPM has emerged as a powerful competitive tool for organizations [Harmon and Wolf, 2012], with interest in BPM from among practitioners and researchers growing rapidly [Ko, 2009]. "Recent research studies confirm that Business Process Management (BPM) is rapidly evolving as the dominant management paradigm of the 21st Century" [ABPMP, 2009] as "more than 80% of leading organizations worldwide have actively engaged in some type of BPM program [Towers and Schurter, 2005]" [Antonucci and Goeke, 2011]. The latest world-wide survey by BPTrends [Harmon and Wolf, 2012] indicates the number of companies engaging in BPM initiatives to expand their business, enter new markets, and gain competitive advantage through innovation is rapidly growing. Even during periods of financial downturn, organizations continue to look to BPM to save costs and refine processes [Harmon and Wolf, 2010]. BPM continues to dominate business priority lists worldwide, as demonstrated by another industry survey by Gartner [McGee, 2010].

People are recognized to be the most critical component in any BPM initiative. "People are at the heart of processes" [Jeston and Nelis, 2010]. Specific BPM success factor studies confirm that employee knowledge, skills, and attitudes lead to BPM success [Alibabaei, Bandara and Aghdasi, 2009; Marjanovic and Bandara, 2010] and that while an increasing number of organizations are interested in adopting or expanding BPM, most lack sufficient internal competencies needed to undertake these BPM initiatives [Bandara et al., 2010]. Organizations have expressed difficulty finding individuals qualified to lead and implement their BPM initiatives [Antonucci and Goeke, 2011; Hill et al., 2006]. This is not surprising considering the variety and depth of knowledge and experience needed to implement successful BPM initiatives.

As organizations are becoming more process oriented and BPM tools and methods continue to evolve, the need for BPM expertise is increasing. BPM initiatives are often complex, expensive, and time-consuming endeavors that can have a high failure rate, particularly when the initiative lacks the required human resources [Alibabaei et al., 2009; Marjanovic and Bandara, 2010]. Current research has recognized new roles and tasks required among those individuals involved in BPM initiatives; "process owners," "process analysts," "process architects," and "managers of BPM centers of excellence" are just some of the example roles that are emerging for which specialized BPM skills are required [ABPMP, 2009; Antonucci and Goeke, 2011]. "Along with this BPM revolution, new organizational structures and roles are emerging and a new genre of professionals is emerging to support these practices" [ABPMP, 2009]. Increasing their BPM capabilities has been recognized globally by corporate CIOs as their number one business priority [McGee, 2010]. These BPM-related initiatives have consequently resulted in an unmet demand for appropriately educated BPM employees [Antonucci and Goeke, 2011; Bandara et al., 2010].

The global demand for qualified BPM personnel has encouraged many universities and industry training providers to offer BPM programs. "Organizations turn to universities to provide a response to the skill challenge. And indeed, BPM is making strides in academia" [Recker, 2012]. The market shows a growing demand for professionals "with a firm grasp of business processes who can deliver on projects" [Lee, 2007], thus causing "a strong demand for college graduates prepared with the knowledge on business processes" [Lee, 2008]. However, there is still an apparent scarcity of appropriate BPM education, which is a perennial issue [Lee, 2007]. Ravesteyn, Batenburg, and De Waal [2008] describe this need for appropriate BPM education. In response to the growing need for specialized BPM skills, university educators in Information Systems (IS), Computer Science (CS), Information Technology (IT), Operations Management (OM), and other disciplines across the globe have started to teach and research BPM, often from very different perspectives [Bandara et al., 2010; Lee, 2007, 2008; Recker, 2012]. Also, for the first time, BPM content is now included in the latest international model curriculum for the undergraduate degree programs in Information Systems [Topi et al., 2010].

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While there has been much research into the field of BPM, in comparison, the area of BPM education has received minimal focus. “Despite the extended research agenda on BPM, studies that specifically address education on BPM are limited” [Ravesteyn et al., 2008]. As more and more universities have started to teach BPM, and BPM is entering the curricula of many institutions, there has not yet been any reported “audit” on the BPM-related skills and knowledge taught in universities. In particular, the “fit” between BPM education and training (the supply side), and the BPM needs of the industry (the demand side) has not been discussed. The intent of this article is to provide an understanding of how current BPM curriculum aligns with required BPM practitioner capabilities. More specifically, this study addresses the following research question: *How well does the current Australian BPM curriculum align with the required BPM practitioner capabilities?*

As the title of this article indicates, this study was conducted within the Australian context with the national (Australian) scope being chosen for the data on the education/training offerings. This decision was influenced by several important reasons. First of all, the researchers were based in Australia and therefore had a strong interest in developing an in-depth understanding of the status of BPM education and demand in this region. The second reason was better/easier access to the data (access to course offerings and knowing how to find them) in this region. Also, an increasing number of BPM-related course offerings were emerging in Australia. Marjanovic and Bandara [2010] created an interest to review the status of BPM education offerings nationally. Furthermore, a selected geographical scope (as opposed to a global scope) was momentous for the feasibility of this study. While this study can be replicated in other regions, a global coverage (where all BPM offerings in the world were identified and included in a single analysis) was not a feasible option for the research team. Finally, based on research on world-wide BPM-related teaching practices, as described in Bandara et al. [2010], we argue that BPM-related education practices in Australia are similar to those of other leading universities and regions in the world and therefore could be used as a representative sample of university offerings.

In addition to choosing a national scope for data on university/training offerings, we chose an international scope for the industry BPM-related demand, represented by the advertised BPM positions. This decision was guided by the following reasons. A significant number of all Australian university students are international students[1] who come from diverse geographical regions and will often be recruited outside Australia (in their countries of origin or others) upon completion of their studies. As the marketplace continues to become more globalised, the demand for graduates with skills that meet international needs is increasing [Shin and Harman, 2009]; we believe this is strongly the case with IT and Business students, who form the main cohort engaged in BPM studies. Universities have started to review their curricula through focusing on internationalization [Levin and Lorimer, 2005]. One of the fundamental steps toward internationalizing the curricula is to understand the knowledge, skills, and attributes expected of the graduates across geographical boundaries to enable the alignment of the curricula to these requirements. This is why we expanded the scope when extracting the job advertisements included in this analysis to a global level, even though the overall focus of the study was limited to an Australian perspective.

This article is structured as follows. First, an overview of the research approach is provided, introducing the phases of this study. The article then describes the need for a framework-based analysis and briefly presents the Business Process Management Maturity (BPMM) model [De Bruin, 2009], which was the selected theoretical basis and framework used to support the analysis and interpretations of this study. Next, our approach to data collection and analysis is discussed; the research findings are then presented, followed by a conclusion that points to future research.

II. OVERVIEW OF THE RESEARCH APPROACH

An overview of the research approach is provided in Figure 1 with each step described in further detail below. First, the researchers conducted a comprehensive literature review to search for suitable BPM frameworks that could be used as the theoretical foundation for this work and also to gain an understanding of core BPM capabilities. The BPM Maturity model [De Bruin, 2009] was selected from this exercise, as it is a rigorously tested research framework that is confirmed and used in practice. The second step was the analysis of the current status of BPM curriculum offered in Australia using two key BPM training/education sources: (a) courses offered by universities and (b) industry training within Australia. The third step in the research identified global online BPM-related employment opportunities via a content search on several established recruitment websites.

[1] At the end of December 2010 there were 291,204 international student visa holders in Australia, a firm indication of the large pool of international students attending Australian universities. Australian Government: Department of Immigration and Citizenship. (2010). *Student Visa Program Report: 2010-11 to December 2010*: Australian Government.

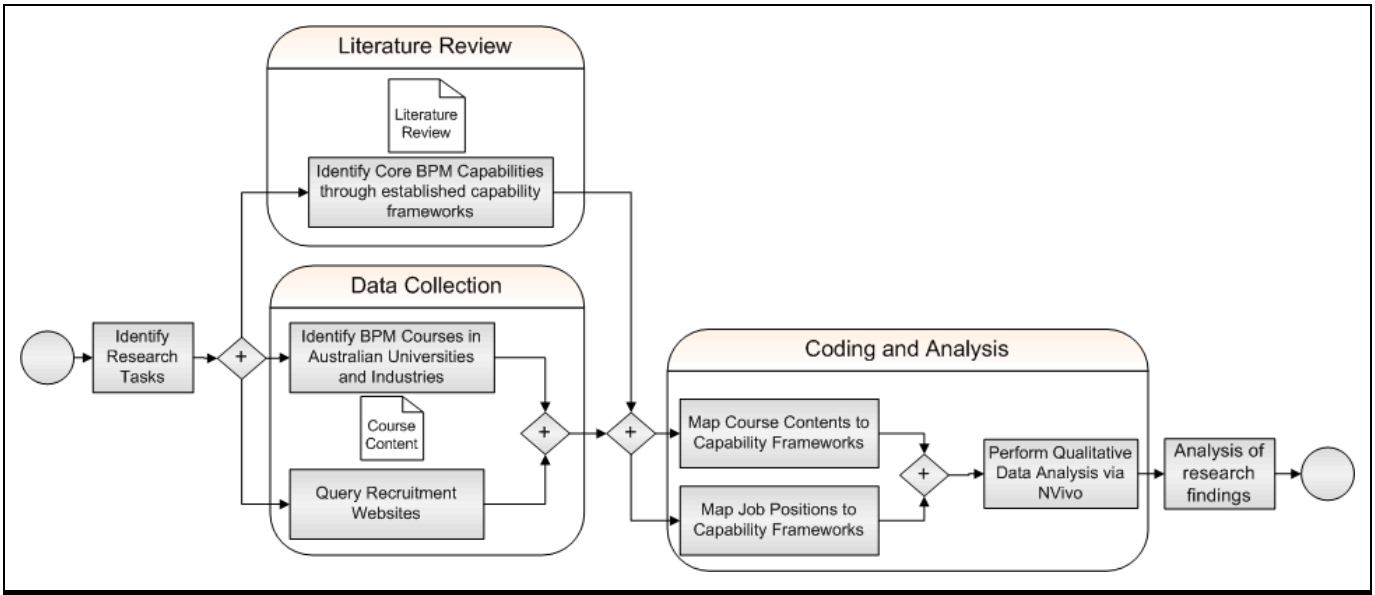

Figure 1. Overview of the Research Approach

The identified BPM course materials, employment opportunities, and capabilities documented in the selected framework were then recorded into a qualitative data analysis database (NVivo[2]) for codification, further analysis, and synthesis. The aim of this research was to identify the status of BPM education/training (the supply side) and BPM job vacancies (the demand side) and then address the perceived gaps through a comparison of Australian BPM curriculum and the preferred BPM capabilities sought by industry. The following subsections elaborate on each of these steps in detail.

III. THEORETICAL UNDERPINNINGS: BPM CAPABILITY FRAMEWORKS

This study was focused on analyzing the "fit" between the supply and demand sides of BPM talent. As our goal was to compare BPM curricula with industry demand, we therefore had to find a means to make this comparison possible. An inductive bottom-up approach (where we would allow the data to directly enable the comparisons) was not viable as both data sources—the course outlines (that represented what was taught) and the job advertisements (which represented what was sought for)—included high (abstract) level data. Neither data set had a clear and common structure or vocabulary, which made it hard to derive effective one-to-one comparisons and justify the findings. Furthermore, information was presented at different levels of abstractions with different formats; hence, identifying themes and positioning themes, if and when identified, was difficult to do with sufficient transparency and a trail of evidence. Therefore, we sought a framework that could be used as a hub for this mapping and formed the theoretical basis for the analysis.

A search for BPM capability frameworks (those that typically describe organizational capabilities) was conducted, where capabilities in this context refer to "the capacity for a team of resources to perform some task or activity" [Grant, 1991] and at the same time are invisible, knowledge-based phenomena [Spanos and Prastacos, 2004; Stalk, Evans and Shulman, 1992]. On this premise, a BPM capability framework would identify and describe the capabilities an organization requires to succeed in BPM, describing the core elements that would characterize a firm's BPM capabilities.

Organizational capability is highly dependent on the constituent elements of "the knowledge underlying the firm's capacity to act, and human actors as the subjects of knowledge creation and application" [Spanos and Prastacos, 2004]. We acknowledge that BPM capability exists at both the individual (personal) and organizational levels [Kokkonen and Bandara, 2010]; this multi-level nature of capabilities is a concept supported more generally across different domains and is not unique to BPM. Organizational capabilities are developed over time and nurtured through complex interactions among organizational members [Amit and Schoemaker, 1993]; this is also the case for BPM. Organizational capabilities are "socially constructed entities, organized in networks of knowledge carrying relations among individuals and inanimate firm assets" [Spanos and Prastacos, 2004]. However, "it is also accepted that knowledge and human actors are the basic 'building blocks' of organizational capabilities" [Spanos and Prastacos, 2004]. Organizational capabilities are a result of the capabilities of its human elements. "Knowledge is

[2] See NVivo website: http://www.qsrinternational.com for further details (current June 3, 2012).

created by individuals and hence, an organization cannot create and apply knowledge without individuals [Nonaka, 1994]" [Spanos and Prastacos, 2004]; the individuals are the possessors and enactors of the capabilities. While we acknowledge that a firm's BPM capability (as denoted in BPM capability models) cannot be reduced to the sum of individuals and must be recognized at the organizational, as well as personal, level, BPM capability frameworks can provide a solid foundation to understand the required capabilities of BPM professionals at an individual level. A BPM capability framework would enable us to map the course offerings to the general capabilities required by firms and what traits they seek in individuals they hire. Mapping the different job vacancies to the framework would also enable us to understand how the sought for capabilities differ based on the diversity of the advertised job vacancies. Hence, we looked for frameworks that would be suited for this.

Ever since the Capability Maturity Model (CMM) [Ahern, Clouse and Turner, 2004] was developed by the Software Engineering Institute, many maturity and capability models have been developed across different domains. The researchers conducted a detailed literature review in search of BPM-specific capability models (using keywords such as "process" and "capabilit*" [and their synonyms] in relevant databases, via the Web, and in BPM textbooks, followed by backward and forward searching). While some papers were found that discussed BPM Maturity models in general [Rohloff, 2009], four distinct BPM-specific maturity and/or capability models were identified from this effort, namely: The Process and Enterprise Maturity Model (PEMM) by Hammer [2007], BPTrends Pyramid Model [Harmon, 2007], The Object Management Group's (OMG) BPM Maturity model[3] [Weber, Curtis and Gardiner, 2008], and The Business Process Management Maturity (BPMM) Model by De Bruin [2009]. We selected the Business Process Management Maturity (BPMM) framework [De Bruin, 2009] to form the analysis of this study. This section briefly describes the other BPM capability models identified and describes why the BPMM model was chosen amongst others. We then present the BPMM in summary and provide the context to the results presented in the next section.

Hammer's [2007] *Process and Enterprise Maturity Model (PEMM)* presents five process enablers (design, performers, owner, infrastructure, and metrics) and four enterprise capabilities (leadership, culture, expertise, and governance) essential for the success of process improvement projects. While each of these capabilities has been decomposed and operationalized by the author to be measured, they were for a different unit of analysis (for improvement initiatives at a process level). Hence, it was not complete enough nor easily adoptable to identify BPM capabilities required by BPM professionals (at an individual level).

The *BPTrends Pyramid Model* defines various types of BPM-related activities within an organization at three different levels: Enterprise level, Business Process level and Implementation level [Harmon, 2007]. Each of these levels requires certain capabilities to support a successful BPM outcome and each level is supported by the previous level. In this manner, each level has a subset of capabilities required to satisfy the organization's goals. The top (Enterprise) level of the pyramid describes how an organization might go about creating enterprise management capabilities, including process architecture, measurement systems, and so on. The middle (Business Process) level describes how one defines, improves, or redesigns a specific business process. The bottom (Implementation) level describes how one generates resources needed to implement a process improvement or redesign and includes capabilities such as automation, human performance improvement, and so on. This framework was a conceptual illustration of organizational BPM capabilities, and was not empirically validated. The framework was more focused on the core activities in each level and, while mentioned in brief, did not discuss in depth the required capabilities to achieve these tasks.

The Business Process Management Maturity (BPMM) model was co-authored by the creators of the CMM [Weber et al., 2008]. It has been written to guide the improvement of business processes, which are positioned and characterized here as transactional workflows across organizational boundaries. The BPMM is divided into five maturity levels that represent different states through which an organization is transformed as its processes and capability are improved.

The BPMM's documentation is extensive, detailed, and provides templates that can be used for assessment. However, while they claim that it can be applied to a number of domains [Weber et al., 2008], no details are provided on how to do so, and the specific capabilities associated with these levels are not discussed in sufficient detail. Furthermore, previous successful maturity model applications are not well integrated and the focus is on processes as workflows across an organization, as opposed to the more holistic view of BPM (as defined earlier in this article) that we perceive BPM to be.

[3] See http://www.omg.org/ for more information on the OMG and http://www.omg.org/spec/BPMM/1.0/PDF to access the details of the BPMM (current June 2, 2012).

The *Business Process Management Maturity (BPMM) framework* (introduced in detail below) was chosen amongst the other possible frameworks that pointed to BPM capabilities (as briefly described above). This boundary spanning holistic framework was developed in academia and verified through international case studies and a Delphi survey where the model was applied and tested [De Bruin and Rosemann, 2004]. In addition, this BPMM model identified capabilities required across a set of factors that have been comprehensively justified and described as essential capabilities for BPM across the organization; the model was empirically validated and has been applied in academia and other research work [Harmon, 2010; Rosemann and Brocke, 2010; Zwicker, Fettke and Loos, 2010]. The model captured capabilities required in a holistic manner for an organization to progress (and was not limited to simple processes or BPM initiatives). Also, in recognition of the fact that organizational BPM maturity continues to evolve, we applied this framework to capture these shifting capabilities. Furthermore, it is based on an established theoretical foundation, has a broad scope, and has high applicability supported by a wide range of industries. In addition, the model supports the requirements of a wide range of stakeholders [Rosemann and Brocke, 2010].

While the BPM course is now included in the IS model curricula [Topi et al., 2010], we argue that the same curricula is not suitable to be used as a guiding framework, instead of the chosen BPMM framework, because of its focus on BPM topics rather than the underlying skills. As each topic could be taught from different perspectives and also at different levels (i.e., awareness versus applied knowledge) the underlying BPM-related skills would be quite different and therefore would not provide a stable enough base for comparison of skills offered and sought after as intended by this research. The BPM Body of Knowledge by ABPMP [2009] was not chosen as a framework, as it focuses too much on industry-based skills, rather than foundation knowledge as aimed by the university-level courses, and has not been validated.

Business Process Management Maturity (BPMM) Framework

De Bruin [2009] has developed a Business Process Management maturity framework that supports the evaluation of organizational BPM capabilities. While the framework is a reflection of an organization's BPM development, these capabilities can be adopted as a basis to identify the capabilities in the staff required to undertake the BPM functions (i.e., the BPM professionals). As argued earlier, organizational capabilities are a result of the capabilities of its human elements. Knowledge and skills are created and held by individuals; the individuals are the possessors and enactors of the capabilities.

The De Bruin [2009] approach offers a holistic BPM Maturity (BPMM) model based upon earlier work, developed to better identify and refine BPM requirements and complexities [De Bruin et al., 2005]. This model has been designed as a diagnostic tool to compare and evaluate the BPM capabilities of different organizations as well as highlight opportunities for organizational learning. The model supports not only the identification but also the assessment of BPM maturity of organizational policies and procedures [De Bruin and Rosemann, 2004]. As Figure 2 depicts in summary, this organizational maturity framework provides a view of the optimum capabilities required to achieve BPM success across six different factors: Strategic Alignment, Governance, Methods, Information Technology, People, and Culture. Each of the six BPM capability factors has underlying organizational (and therefore individual) capabilities which must be in place to support BPM success. For example, several of the factors refer to the capabilities of process management and improvement, which require the essential skills of process analysis and creativity combined with specific domain knowledge [Rosemann, 2008]. We recognize that some of these individual capabilities (process attitudes and values) are not easily taught and that factors such as organizational culture are critical to the success of any BPM initiative. De Bruin [2009] also explains how organizations are likely to display higher or lower emphasis on these different factors based on the BPM approach used, which lifecycle phase of BPM implementation/adoption the organization is in, and the overall level of BPM Maturity. For example: "during early stages of implementation, companies adopting a BPM initiative consistent with a lifecycle approach are likely to display higher emphasis on the Methods and IT factors than companies adopting a BPM initiative consistent with an organizational approach" [De Bruin, 2009]. Table 1 lists and describes the core factors briefly. Column 3 of Table 1 presents a list of implied individual level capabilities that are required for progressing further with each factor. These implied capabilities were determined by the research team, then influenced and informed by related literature [De Bruin et al., 2005; Jeston and Nelis, 2008; Rosemann and Brocke, 2010] that described the BPM Maturity model in detail. They were created as a provisional translation of the organizational level factors to individual level capabilities. These implied capabilities for each factor were established with the joint input from the research members. The mapping (as described in detail later) was always done by considering the context from which the data came. Some implied individual capabilities—such as "strategic focus" or "software skills"—were unique to some factors, whereas some implied individual capabilities—such as "process management" or "leadership"—were important across different factors.

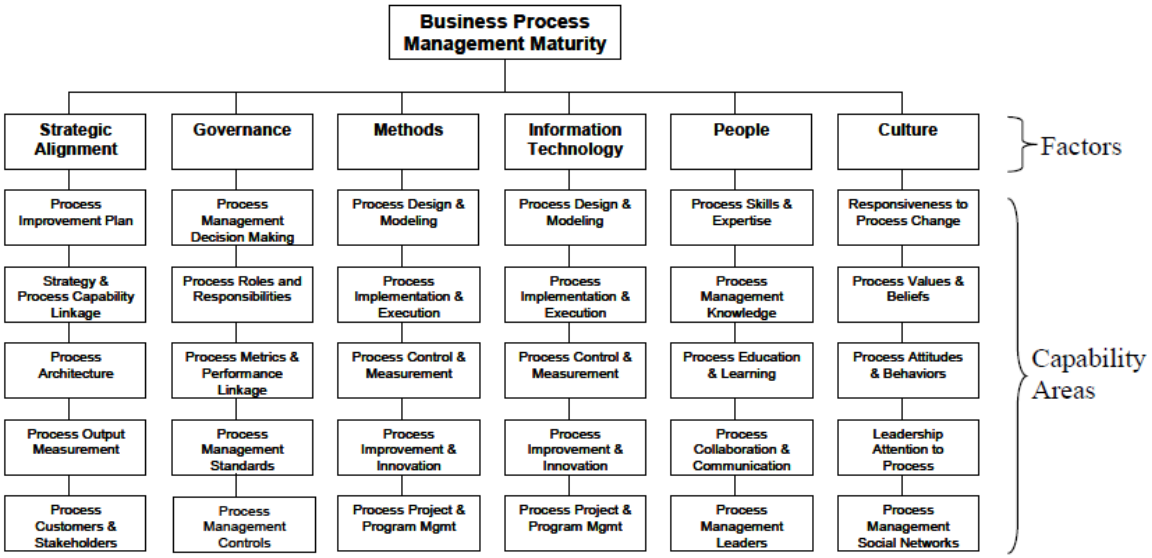

Figure 2. The BPM Maturity Framework (De Bruin 2009)

Though each of the factors in this framework is independent of the others, the overarching targeted outcome is a positive organizational impact and success of the BPM initiative [De Bruin et al., 2005]. The use of this organizational maturity framework provides us with a view of the required employee capabilities in BPM at various levels used to achieve BPM success. This framework has been applied to capture and systematically analyze the core professional capabilities by industry (identified through job vacancies) in preparation for comparison to currently available BPM curriculum. We also posit that the organizations at a higher level of BPM maturity are very likely to have very different needs and requirements for their BPM workforce than those that are just starting their BPM-related initiatives [De Bruin, 2009]. Also, organizations seeking to achieve a higher level of maturity than the one they are currently at will again have different requirements for their future BPM workforce, in terms of their ability to guide the required change.

Table 1: Capability Factors and Derived Implied Capabilities

BPM capability factors	Definition	Implied capabilities
Strategic alignment	Alignment to corporate strategy and mission	Strategic Focus; Process Management; Communication; Leadership; Negotiation
Governance	Organizational implementation of BPM and responsibilities for assigned tasks	Process Management; Leadership; Project Management
Methods	Methods for all BPM relevant tasks	Process Modeling; Process Frameworks; Process Training; Process Model Development; Workshop Facilitation; Stakeholder Interviews
Information technology	Technology which supports & enables BPM	Software Skills; Process Modeling; Process Management; Project Management
People	Competencies of people involved in BPM	Process Expertise; Process Management; Process Qualifications; Communication; Leadership; Negotiation; Collaboration
Culture	Common values toward BPM and process change	Adaptable to Change; Process Thinking; Leadership; Communication; Collaboration

IV. DATA COLLECTION

We discussed earlier the necessity for alignment between BPM curriculum and industry requirements, and introduced the Business Process Management Maturity model which was used as the theoretical basis for this analysis. The following sections present how the search for BPM educational sources and industry requirements for BPM was conducted and the type of data collected and included. BPM education sources included in this study were of two types: those offered by universities and those offered by industry training. Course outlines available on the Web formed the main input, with a focus on the listed content (claimed to be covered) and learning objectives; this approach was also taken by other similar curricula review studies such as Ho and Frampton [2010] and Lee [2007, 2008]. Industry requirements for BPM positions were also captured through a content analysis of employment

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opportunities advertised on recruitment websites, similar to the approach taken by other studies (i.e., Robinson et al. [2008].

Understanding BPM Curriculum Offered by Australian Universities

In order to maintain completeness of the data set, the search commenced by targeting all Australian universities for BPM course offerings. The researchers extracted a list of all Australian universities[4] and reviewed each university website. Thirty-nine universities were included in this search process, where the focus was to identify all courses and units related to BPM in Australian universities. To clarify the terminology used here, a "course" is equivalent to a degree program (i.e., a Bachelors or Masters), and a "unit" is equivalent to a single subject you would take within one semester of the degree. The overall searching was undertaken in two complementary ways:

1. Search by Unit Description: Some universities had search options by unit (a single subject that was offered within a program/course), so a key terms search was conducted. Key terms such as "Business Process," "Process Management," "Process Modeling," "Process Improvement," and "Process Optimization" were used for retrieval.
2. Search by Faculties/Schools/Disciplines: Since most BPM offerings sit within Business and/or Information Technology (IT) faculties, courses and units under these two faculties have been reviewed (all thirty-nine universities offered Business and IT courses).

When the university website allowed searching by unit description, a Search by Unit Description (option (a)) was used. At other times, Search by Faculties/Schools (option (b)) was used.

The primary source of data extracted via this exercise was the unit outlines; the following analysis was based on a content analysis of these outlines. Analyzing the content of unit outlines accessed via the Web has been practiced in other studies [Ho and Frampton, 2010; Lee, 2007, 2008], in particular to analyze the status of education in emerging fields. The dependence on unit outlines is acknowledged as a limitation of the study, considering the limitations of information provided in unit outlines and lack of standard templates. As Lee [2008] acknowledges, this can also omit the inclusion of some instances—if the information is not available in the Web.

All outlines and their context (currency, content covered, etc.) were confirmed by contacting the course/unit coordinators or listed contact persons. Information such as university location, course degree level (e.g., undergraduate or postgraduate), faculty, and course prerequisite were captured to be used in the data analysis for descriptive purposes.

Each unit outline was pre-analyzed for validity, and the outcome returned interesting results. We found in some cases, even though a unit was specifically called "Business Process Management." it did not really cover BPM concepts. During the process of collecting and analyzing the course objectives, we initially identified a BPM course offered by one university that discusses business process optimization, business needs, and changes to processes, including model, evaluation, and design of business processes. Once the course outline was received, it showed the course focus is on system analysis and design (with strong "IT systems development" and little "process view"); hence, this course was taken out from the data set.

One of the challenges was to answer "what courses should be included as a BPM course?" and which should be included/excluded from the data set? The BPM Common Body of Knowledge [ABPMP, 2009] was used as a basis for this decision. While limitations of the ABPMP Body of Knowledge (BOK) have been raised [Bandara, Harmon and Rosemann, 2010], to date this is the *only* source currently available that describes the core knowledge areas of BPM professionals. The ABPMP BOK identifies nine BPM knowledge areas that reflect the fundamental knowledge required of a BPM professional: Business Process Management; Process Modeling; Process Analysis; Process Design; Process Performance Management; Process Transformation; Process Organization; Enterprise Process Management; and BPM Technology.

Based on the previously mentioned knowledge areas and mapping of university BPM course content, three main categories within the extracted pool of BPM courses emerged (Figure 3 illustrates this categorization):

- *Core* BPM courses: those which cover core BPM concepts focused on suggested knowledge areas by ABPMP [ABPMP, 2009];

[4] This list was extracted from http://www.australian-universities.com/list/ (current April 27, 2011).

- BPM-*related* courses: those which do not cover *core* BPM concepts but cover related and/or peripheral knowledge related to business process management, such as change management, ERP, and information systems; and
- *Out of the BPM scope* courses: these were the courses that were picked up in the primary search but later excluded through more detailed analysis of their respective contents.

This classification was completed through multiple iterations, each time confirming the details and decisions with two to three researchers in the team. In the first iteration, the *Out of the BPM scope* courses were checked and removed from the data set. Next, all extracted relevant and core BPM courses were checked again to confirm they were grouped correctly. The summary results from this were checked and confirmed by multiple researchers in the team, to determine which courses should be included in the *core* category and which should stay in the *related* category. Figure 3 depicts the summary of this analysis. The remainder of this article will discuss only the core BPM courses. At this point, we would like to acknowledge the limitation that results from focusing only on the core course offerings in this analysis. We understand that most of these offerings are positioned within an overarching degree program (that can have other subjects taught in addition to core BPM units) that could complement the overall BPM skills and knowledge. However, these course pathways were not transparent and not accessible to the research team and the analysis presented here took place solely on the information about the content covered within the core BPM offerings.

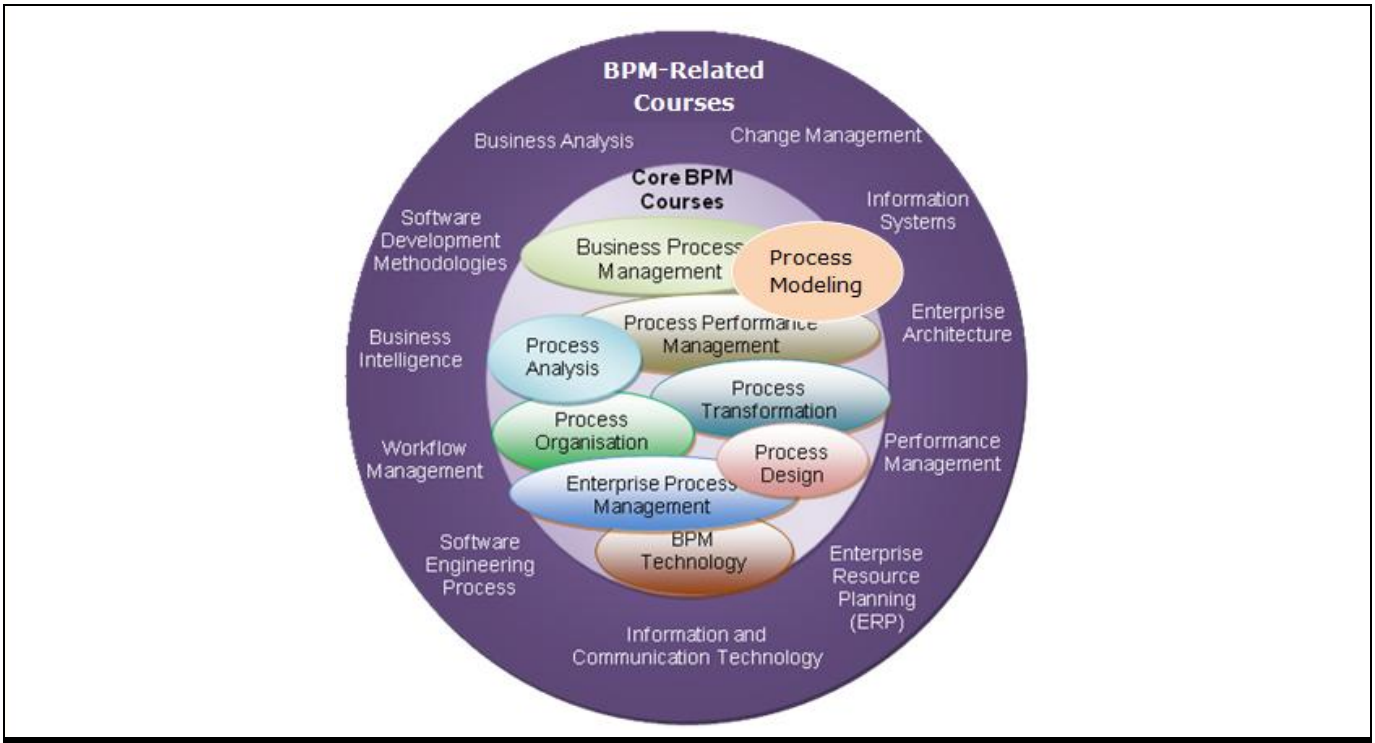

Figure 3. Core BPM Courses and BPM-Related Courses

The high-level summary of current BPM offerings in Australia is shown in Table 2 and Table 3. Eleven universities in Australia currently have core BPM offerings, which are quite diverse in terms of approach, major, and department/school.

As is made clear from Table 2, two department types (within the listed universities) are offering BPM courses: IT and Business. If the course is offered in an IT department context it is more IT driven and the course contents focus more on IT aspects of BPM. Similar results can be seen when a course is offered in Business departments: the content emphasizes more of the business perspectives of BPM. As previously stated, these characteristics observed in Australian offerings are comparable to those of other regions in the world, based on findings presented in Bandara et al. [2010].

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Table 2: BPM Courses Offered by Australian Universities				
University	Department	Degree level and nature of offering	Prerequisite	Location (state)
The Australian National University	Business	Postgraduate (a single unit on BPM)	No	Australian Capital Territory (ACT)
Bond University	Business	Postgraduate (a single unit on BPM)	Yes, IT/Business base	Queensland (QLD)
Curtin University	Business	Postgraduate (a single unit on BPM)	No	Western Australia (WA)
Macquarie University	IT[5]	Undergraduate (a single unit on BPM)	Yes, IT base	New South Wales (NSW)
Monash University	IT	Undergraduate/ Postgraduate (two units dedicated to BPM)	Yes, IT base	Victoria (VIC)
Queensland University of Technology	IT[5]	Undergraduate/ Postgraduate (a series of units dedicated to BPM)	No	Queensland (QLD)
Swinburne University of Technology	IT	Postgraduate (a single unit on BPM)	Yes, IT base	Victoria (VIC)
University of South Australia	IT	Postgraduate (a single unit on BPM)	Yes, IT base	South Australia (SA)
University of Sydney	Business	Undergraduate/ Postgraduate (two units dedicated to BPM)	Yes, Business base	New South Wales (NSW)
University of Tasmania	IT	Postgraduate (a single unit on BPM)	No	Tasmania (TAS)
University of Western Australia	Business	Postgraduate (a single unit on BPM)	No	Western Australia (WA)

Understanding BPM Curriculum Offered by Non-tertiary Institutions in Australia

Searching for BPM courses offered by Australian industry training providers (non-tertiary institutions) was more difficult than searching for BPM courses in Australian universities. The main search engine used was Google and the search was based on key terms. Key terms such as “BPM Training,” “Business Process Management Training,” “BPM Consulting,” “BPM Course,” “BPMS Training,” and “BPMS Course” were used here. Some websites in the BPM area—such as BPTrends, OMG, and Gartner—were also reviewed for BPM training-related advertisements. Information such as course location, duration, prerequisites, and target audience were captured to support the analysis.

There is no definitive list available for non-tertiary training institutions in Australia; among those found that offer BPM training, not all had their course details available online. Industry training providers do not provide their course information in a consistent way. For example, some don’t list their course content, target outcomes of completing the course (i.e., learning objectives), or specify their course’s locations. This is acknowledged as a limitation of this article, as it can impact the completeness and accuracy of the findings. However, while limitations exist with the information available about commercial BPM training in Australia, they were still included to provide the most complete analysis possible with the available data.

The Web search results show eleven institutions in Australia provide commercial BPM courses. A summary is shown in Table 3. Commercial BPM programs range from a half-day workshop to five days, with a diversity in structure and content. Most of the courses target Modelers, Business Analysts, and Managers.

[5] In these universities, BPM was offered under a division of IT that belonged to the Science (or Science and Technology) Faculty. Thus, to simplify this, these were also listed as “IT” in this table.

Table 3: BPM Courses Offered by Non-tertiary (Industry) Training Institutions				
Institute	Duration	Prerequisite	Targeting specific audience	Location[6] (state)
Leonardo Consulting	1–4 days	Yes	N/A[6]	NSW, QLD, VIC, WA, ACT
QUT BPM Training	1–2 days	N/A	N/A	QLD
Object Training	1–3 days	Yes	Modelers, Business Analysts	NSW, QLD, VIC, WA, ACT, SA
Promendo	2 days	N/A	Modelers, Business Analysts, Managers	NSW, QLD , VIC, WA, ACT
Software Education	3 days	Yes	Business Analysts, Managers	NSW, QLD, VIC, ACT, SA
Software AG	½–4 days	Yes	Developers, Analysts	NSW, VIC, ACT
IBM	5 days	No	Modelers, Business Analysts, Managers	NSW, VIC, ACT
Prime Process Management Group	1–3 days	N/A	Modelers, Business Analysts, Managers	QLD
Ind-iOctane	5 days	Yes	Business Analysts	VIC
Process Mapping	1–3 days	Yes	Business Analysts, Managers, Developers	N/A[7]
SAI Global	2–10 days	Yes	Business Analysts, Managers, Developer	NSW, QLD, VIC, ACT

BPM Employment Opportunities

The fundamental approach taken for this article was the identification and qualitative analysis of leading recruitment websites, with a focus on BPM-related employment opportunities. The researchers' intent was to provide a clear understanding of the BPM capabilities and attributes sought by organizations and how these requirements align with known BPM capabilities. Following a comprehensive literature review to gain an understanding of required capabilities, researchers extracted, evaluated, interpreted, and mapped BPM opportunities advertised via online recruitment websites onto the BPM Maturity model. The following well-known recruitment websites were chosen for this study on the assumption that most BPM-related vacancies would be advertised on these sites—monster.com, careerbuilder.com, seek.com, and dice.com. Data was sought from three geographic regions—Australasia, Europe, and North America—on the assumption that most BPM positions will be located here. The job identification and selection process covered a six-week period (mid-March 2010 to late April 2010). For consistency and repeatability of the website search and retrieval exercise, a list of key search terms was derived following an initial analysis of recruitment advertisements retrieved in a pilot study. This list of key words (i.e., "Business Process Management," or "BPM"; "Process Management"; "Process Modeler"; "Process Analyst"; "Process Engineer"; "Process Architect"; "Process Manager"; "Process Consultant"; "Process Owner"; "Process Officer") were used consistently across these websites during the six-week data collection phase to identify a range of "process" related jobs. The search terms were chosen to ensure that the results returned were broad enough to also encompass BPM-related positions that were not explicitly defined as such on the recruitment webpage. Jobs were searched and extracted for each of the selected regions on a "first-found-then-entered" basis. No pre-screening was done for these job advertisements except to validate that it was a description for a BPM role. An equal number of job advertisements were sought for from each region to compose a regionally representative sample. In total, 105 jobs were extracted and included in this analysis, with thirty-five BPM-related positions from each of the regions.

Once individual BPM job advertisements were captured in the database, each position was reviewed and a series of attributes such as career level, education qualification sought, employment type, and so on, were allocated based upon the text provided in each job description (see Table 4). These attributes are typically tangible and measurable characteristics that can be used to differentiate between the advertisements and were used in the analysis.

V. PREPARING FOR CODING AND ANALYSIS

This section presents the steps followed to answer the research question: *How well does the current Australian BPM curriculum align with the required BPM practitioner capabilities?*

To recap, current Australian BPM curriculum and advertised employment opportunities have been captured and the BPM Maturity framework [De Bruin, 2009] identified as an appropriate capability framework to support their

[6] Please see Table 2, Column 5, for the full list of the locations listed here.
[7] N/A means the required data was not provided in the institution website.

comparison. This section describes how the BPM Maturity framework was set up in the selected qualitative tool (NVivo) as a coding schema, and how the extracted educational and training content and job advertisements were set up in the tool, in preparation for the analysis.

A qualitative data management and analysis application, NVivo was chosen to support the systematic coding and analysis of data within a single repository. This tool can be used to manage, code, interpret, and analyze qualitative data by eliminating the need for many of the manual tasks traditionally associated with qualitative analysis [Sorensen, 2008]. NVivo allows for the import and coding of textual data, text editing, retrieval, review and recoding of coded data, searching for combinations of words in the text or patterns in the coding, and import or export data to other quantitative analysis software [Bazeley, 2007]. NVivo was one amongst many tools to select from; most of the main qualitative data analysis software packages (such as NVivo, Atlas/ti) have similar features. NVivo was used here, as its functionality supported the required tasks. In addition, the researchers had ready access to the software through an institutional license and had prior experience using the tool.

Once the BPM course outlines and job advertisements were collected, they were saved and imported into NVivo as "source" documents. "Sources" are research or project materials—anything from electronic files or video recordings of research settings to typed memos capturing thoughts and ideas. Each individual unit outline and each individual job advertisement that was extracted was stored as a separate source document. Attributes were defined for both the source types. Each job advertisement was reviewed and a series of attributes such as "Career Level," "Education," "Employment," "Industry," "Salary," and "Experience" were allocated based upon the text provided in each job description (see Table 4). "Location," "Department," "Degree Level," "Prerequisite," "Duration," and "Audience" were example attributes used to further define the BPM course offerings (see Tables 2 and 3). Tagging the sources with these defined attributes enabled us to perform queries on the collected data, which supported the analysis.

Table 4: Attributes Maintained for the Extracted Job Advertisements

Career level	Education	Employment	Industry	Location	Salary	Experience
Intern Non-manager Manager Experienced	Bachelor Masters PhD	Full Time Part Time Contract	Finance Health Education Technology Government	North America Europe Australasia	$50,000–$80,000 $80,000– $100,000 $100,000+	1–3 years 3–5 years 5+ years

A protocol was devised to support the analysis. As discussed previously, we used the De Bruin [2009] framework as the basis of the classification schema for the data analysis. Each of the capability factors were carefully defined and implied individual capabilities identified early on (see Table 1 for a summary). The six capability factors of the framework were entered into NVivo as "tree" nodes (a tree node is a physical location within the NVivo tool, like a folder that is catalogued in a hierarchical structure). The data (the education offerings and the job descriptions) were mapped to this classification. The data from our sources were relatively high level and abstract; hence, the mapping was also limited to an abstract level.

Each time a "capability" was mentioned either explicitly or by implication in the source data, they were mapped to the related node in the classification scheme. First, the context of the capability was reviewed by the coder, to try to understand what potential factor/area of the BPMM model the identified capability was most likely referring to; we also used the implied capabilities list (see Table 1) to assist with this. For instance, when coding the job advertisements, we looked at the job role, designation, and associated tasks that were described to get a first impression of what kind of capability (in relation to the BPMM model factors) the data best aligned with. When a generic capability (such as process management—in general) was mentioned, it was mapped across multiple factors based on the context in which the data presented itself. For example, if the outline of a unit that is specialized in teaching process modeling stated that a learning objective was "to provide a firm basis to Business Process Management... and the students will be trained on the fundamentals of process mapping using advance process modeling tools ...", then this statement would be mapped under both the Methods node (to capture the teaching of BPM to support process modeling) and IT node (to capture the teaching of BPM in association with IT. Here, the technology is the advanced process modeling tool). The same content was allowed to be coded in more than one node if it mentioned the capabilities across multiple factors. For example, where a job advertisement mentioned "Experience in business process mapping and team leadership" the advertised position would be coded under both the Methods (to capture the requirement for knowledge of process modeling methods) and the People nodes (to capture process leadership capability).

Two coders conducted the mapping exercise (each focusing on the two data sets: the education offerings and the job advertisements). The coding of a subset of each of the two data sources was reviewed by a third and fourth researcher to confirm that the protocol was adhered to and that it was clear.

The overall research findings and the analytical activities applied to support these findings are presented in detail in the next section.

VI. RESEARCH FINDINGS AND DISCUSSIONS

The following sections present (a) a descriptive overview of the Australian BPM education offerings, assessing their current status; (b) the BPM capabilities sought by industry (based on the capabilities of the BPM Maturity framework); and (c) the alignment of Australian BPM education with the sought after BPM capabilities by industry.

While the main focus of the analysis was on the high level mapping of the data sources to the capabilities (as presented later), there were more granular observations that were made during the analysis at times. These granular observations were captured when "patterns" were observed across the data. They were noted in memos and later discussed and confirmed with the research team. While these granular details were not the main focus of the study analysis, they are referred to (in the presentation of the findings as deemed relevant) when they support further understanding and deeper interpretation of the high level study findings.

Overview of the Australian BPM Education Offerings: Its Current Status

To capture current BPM training offerings, two sources were looked at: Australian universities and Australian industry training providers. The available BPM curriculum was analyzed and mapped to the De Bruin [2009] BPM maturity framework using the NVivo qualitative analysis tool as explained in Section V. This mapping was done via a content analysis of the text found within the curriculum offering descriptions (i.e., in the unit and course outlines). As explained in Section V, any direct or implied skills were mapped against the relevant BPM capability areas (as in the BPM maturity framework—sometimes allowing for double coding of the same content to two different capability areas, if the context and descriptions warranted such). Figure 4 depicts the summary result of this mapping exercise.

The graph (Figure 4) presents the distribution of the total content that was coded from the industry and university offerings across the different factors. Among the coded content from the offerings, 59.62 percent originated from text associated with industry offerings and 40.43 percent came from university offerings. Through interpretation we can assert that BPM training offered by industry providers covers IT-related capabilities more frequently (21.12 percent of the total coded content) as compared to university level BPM education (which was only 9.94 percent of the total coded content). Similarly, the BPM capability factors of Governance and Methods appear to be predominately taught by industry training providers moreso than what is catered for in Australian university curriculums.

As observed, both universities and industry training providers do not offer as much in their curriculum in the areas of Culture and People but predominantly focus on education related to IT and Methods capability. Our research confirms that the curriculum in both sectors is highly focused on technical capabilities such as modeling, process analysis, process management, and process improvement. Universities still do provide curriculum in Culture, People, and Strategic Alignment, more than what is available through commercial training providers. This may be attributed to the fact that these capabilities are typically taught as part of a broader university curriculum.

Further, the analysis pointed to evidence that the industry training providers focus their curriculum more on Business Process Management Systems (BPMS) knowledge transfer and training (observed through the granular details identified under the coded content of the IT node) than universities do. A possible reason could be that BPMS are too expensive for universities [Bandara et al., 2010]. An even more compelling reason could be the target audience. Industry training often targets operational staff and developers (refer to Table 3) with very specific learning needs (e.g., employees who often have to use a certain BPM system). Universities focus on the development of fundamental BPM knowledge competencies beyond tools and current BPM solutions, compared to industry training, which tends to be skill-based. For example, universities seemingly cover more strategy and Program/Project Management topics than industry providers. These skills are discussed as broad concepts within other BPM topics. Now, for universities, their goal is to provide a clear understanding for students of how to manage business processes, including an understanding of strategy-to-process linkage, defining processes, and analyzing processes, as well as gaining "insight into corresponding challenges such as team management, presentation skills and project management" [Bandara et al., 2010].

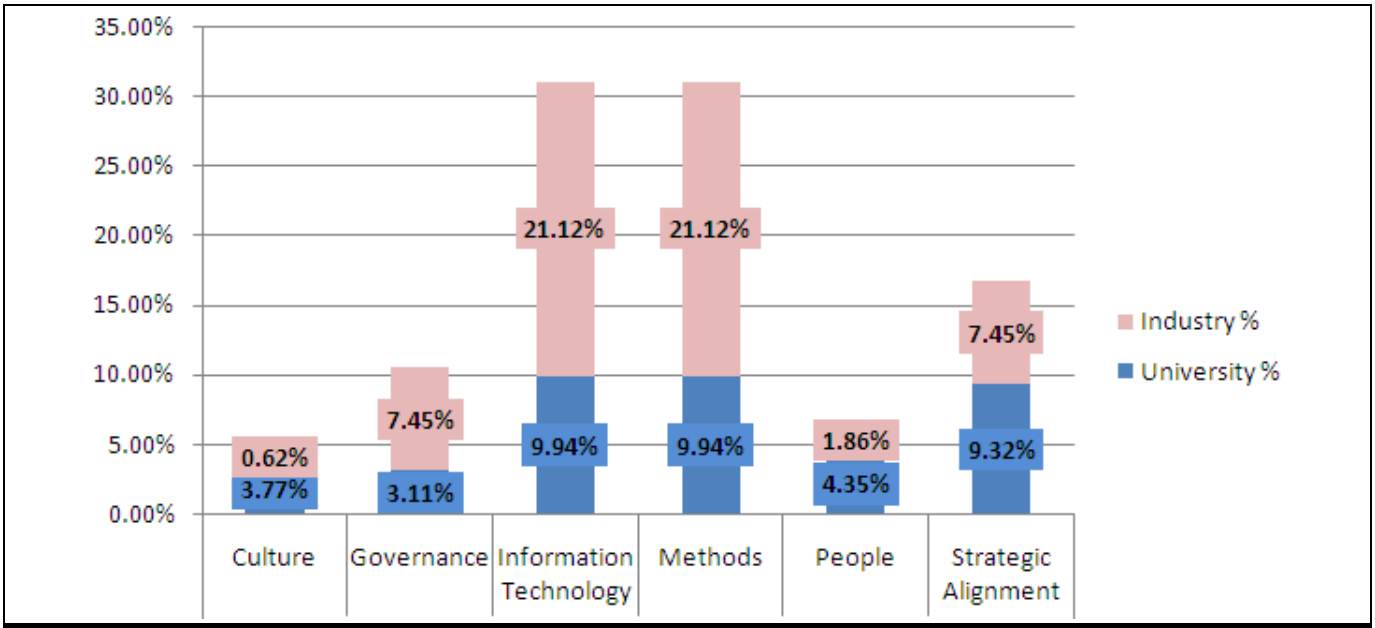

Figure 4. Mapping of BPM Training Context to BPM Capabilities

We observe a differentiation between university and commercial approaches to BPM education. This trend is perpetuated by vendors of different BPM software applications who view BPM through their commercial lens. However, to ensure transferability of student learning to yet unknown BPM environments of the future, universities need to design student learning experiences beyond current technical solutions. In other words, in addition to BPM-specific knowledge and skills, learning experiences need to be designed to help students to know how to effectively learn in a constantly changing environment. This particular approach to design and implementation of student learning experience is probably one of the fundamental differences between university and industry offerings, or should be.

Furthermore, the fact that Culture and People are core aspects in organizations for BPM maturity [Rosemann, De Bruin and Power, 2006] and that these factors are known as BPM success factors [Alibabaei et al., 2009], there are not enough training resources available on these topics. One reason for this might be that only organizations with more mature BPM initiatives are ready and in need of these capabilities. However, given the view that only 5 percent of organizations are in a highly matured BPM state [Harmon and Wolf, 2012], there might not be enough demand for training in these capability areas. We can interpret this 5 percent of BPM mature organizations to be ranked at Level 5 of the Capability Maturity Model Integrated (CMMI) process maturity scale [Harmon and Wolf, 2012]. Another reason could be that Culture and People, core capabilities required for successful BPM, sit more under Change Management concepts [Lovea and Gunasekaran, 1997; Todnem, 2005]. Hence, organizations may source training for these needs from specialized change management and human resources training providers that do not necessarily fall under the BPM training banner.

We also argue that traditional classroom education is not the most appropriate model for acquisition of BPM competencies related to People and Culture. Having in mind that these BPM dimensions are always highly contextual and require experiential knowledge, they are best studied in context and through more active approaches to learning such as, for example, action learning. In summary, Figure 4 illustrates the status of BPM education in Australia in relation to key BPM capabilities of the BPMM model. The outcomes reported here can be used by Australian universities and training institutions to better align and position their training materials to required BPM capabilities. It could also be beneficial to individuals looking for a systematic and in-depth understanding of BPM capabilities and training.

Business Process Management Capabilities Sought by Industry

The required capabilities as stated in advertised BPM positions were identified and mapped to the De Bruin [2009] BPM Maturity framework using the NVivo qualitative analysis tool. This was achieved through a content analysis of text from the job advertisements, mapped to the different capability areas as described in detail in Section V. The results of this capability mapping exercise are presented in Figure 5. This graph presents the distribution of the total advertised BPM positions (Y axis) across the three geographic areas of North America, Europe, and Australasia (X axis). As mentioned in Section IV (Data Collection), the advertised BPM employment data was retrieved from

recruitment firm websites over a six-week period using a set of defined search terms derived from an earlier pilot study.

From the analysis presented in Figure 5, it is evident that the following factors—Methods, Information Technology, and People—are the most sought after BPM employee capabilities. From the total sample of 105 global BPM employment opportunities (thirty-five from each geographic region), ninety-two positions (88 percent from the total pool within this data set—based on twenty-nine from North America, thirty-two from Europe, and thirty-one from Australasia) seek capabilities listed against the Methods factor, fifty (48 percent) seek Information Technology capabilities (based on seventeen from North America, twenty from Europe, and thirteen from Australasia), and thirty-seven (35 percent) of the opportunities (based on ten from North America, twelve from Europe, and fifteen from Australasia) ask for People skills. The factors of Culture (four positions in Europe and Australasia) and Governance (twelve positions across the three regions) are the least required capabilities; this is possibly a reflection of current organizational BPM maturity. Factors like Culture and Governance play a bigger role in more mature organizations where enterprise-wide BPM exists. In most organizations BPM is still only at project/initiative levels (a result of lower levels of BPM maturity). Based upon a more detailed review of these positions, it was also clear that whilst university level qualifications are sought across the regions, industry qualifications (such as Six Sigma/PRINCE2 certification) are also highly valued.

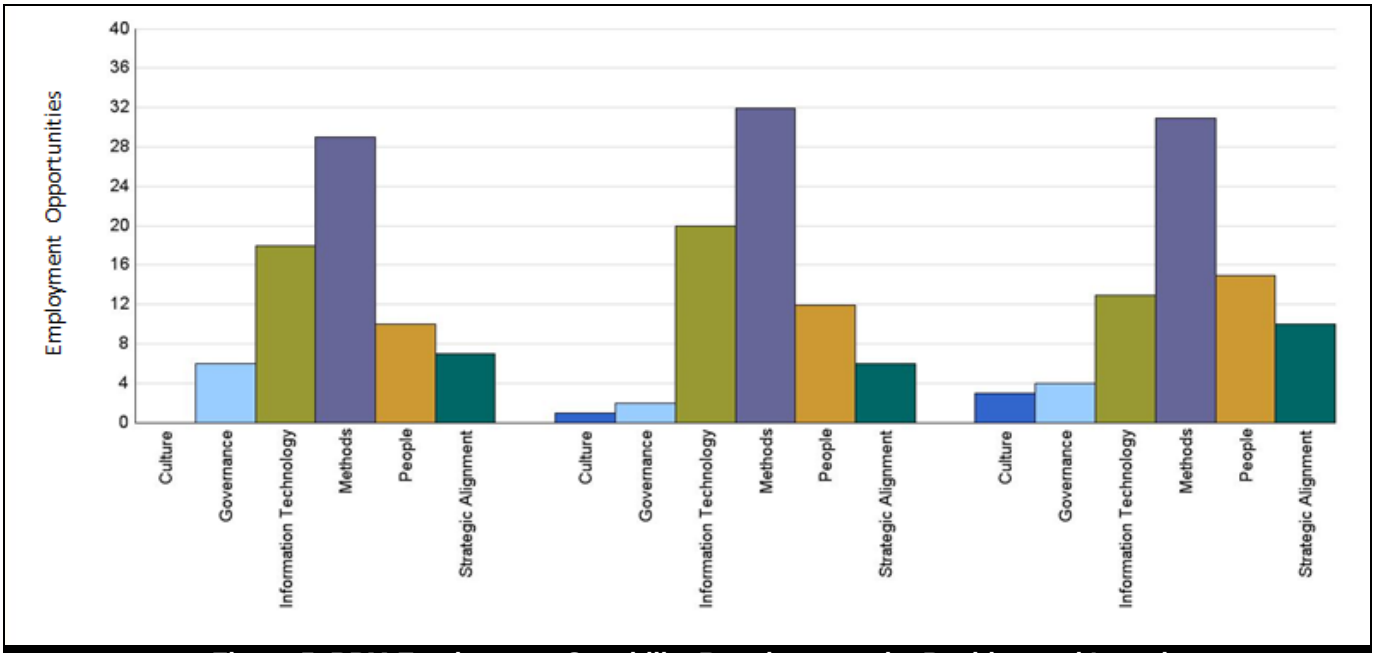

Figure 5. BPM Employment Capability Requirements by Position and Location

Further interpretation of Figure 5, based on the number of employment opportunities per location, shows some interesting patterns. First, of the thirty-five employment opportunities captured in each of the three geographic regions, the most sought after implied BPM capabilities were those captured under the Methods factors. Second, across all of the regions, Culture was the least sought capability factor, especially in North America. What is evident is the consistency across all regions for the applicants of a high number of BPM positions to have capabilities in the areas of Information Technology, Methods, and People, closely followed by Strategic Alignment.

Alignment of Australian BPM Education to Industry-required BPM Capabilities

From the analysis of the 105 identified BPM employment opportunities (thirty-five from each geographic region), 52 percent of these advertised positions required some form of university qualification, with North America being the predominant region to require PhD level qualifications. Table 5 provides a representation of where graduate and postgraduate qualifications are most sought in relation to the total advertised positions. Based on this analysis, 63 percent (twenty-two of the thirty-five) of all North American advertised BPM positions required a Bachelor level degree, compared to 32 percent (eleven of the thirty-five) for both Europe and Australasia. One reason for this low demand for university qualified BPM staff may be due to the current immaturity of the BPM market. We are likely to see demand for BPM education rise in the future as this is one of the "aspects involved in the development of high levels of BPM maturity and capability" [Tregear, 2011].

In contrast, from a curriculum perspective (Figure 6), most Australian BPM courses (70 percent) are offered at a postgraduate level. This is an interesting observation, since by comparison only 36 percent of total advertised BPM

Table 6: Educational Requirements by Position Across

Education	North America	Europe	Australasia
Bachelor	22	11	11
Masters	4	3	1
PhD	2	1	0

positions in Australia require a university qualification, with the majority (32 thirty-two of the total) of those positions at the Bachelor's degree level. This anomaly indicates that the focus of BPM training in Australia should increasingly be on the undergraduate student population to ensure the above industry demand is adequately met.

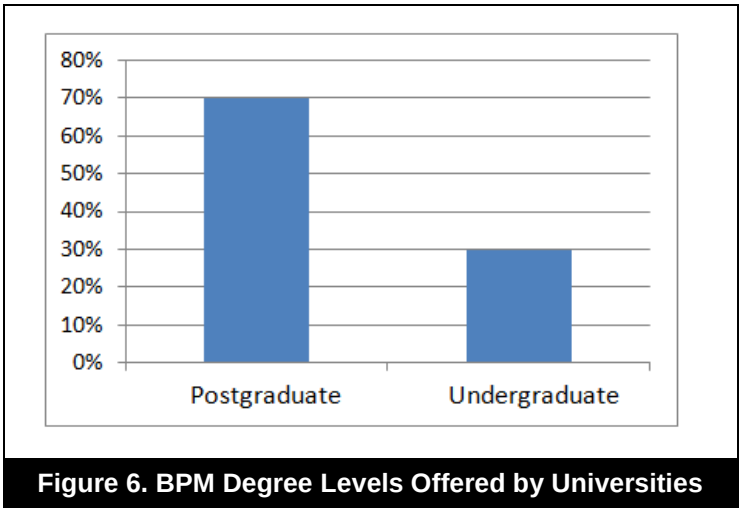

Figure 6. BPM Degree Levels Offered by Universities

One possible reason for the high proportion of postgraduate BPM education could be that "BPM is both a management discipline and a set of technologies that supports managing by process" [ABPMP, 2009]. To be an effective BPM practitioner, a broad range of skills such as subject domain knowledge, workshop facilitation, change management, and even creativity are required [Rosemann, 2008]. These are the attributes more commonly expected at the postgraduate level. However, as mentioned previously, up to 95 percent of organizations are not in a matured BPM state [Harmon and Wolf, 2012]; therefore, a BPM practitioner with undergraduate degree qualifications will likely fulfill their organizational requirements. Alternatively, it could also be that the demand for that level of skill is greater in more strategic positions; in other words, there are lower level BPM positions required in general that do not require the advanced skills that one obtains from Masters level education.

Further analysis shows that demand for Strategic Alignment, Governance, and Culture appear to align with available training. These capabilities are the least requested skills in the job market for BPM practitioners. Again, this may be a reflection of current organizational BPM maturity where a demand for these skills has yet to surface. We can make a prediction here that as organizational BPM maturity increases, the demand for these skills will increase. Another reason could be that the job market does not see these capabilities as core BPM skills. This could be a confusion created as a result of "firms struggling to define the direction of their BPM efforts, causing difficulty defining the knowledge, skills, and abilities their BPM professionals should have" [Antonucci and Goeke, 2011].

These are some key observations drawn from the previous analysis. The De Bruin [2009] BPMM framework allows us to analyze and, more importantly, categorize the current industry demand. The higher level BPM enterprise activities of strategic alignment and governance are least in demand, which is possibly a reflection of current organizational BPM maturity.

VII. CONCLUSION

The objective of this article was to analyze the current state of BPM education in Australia and BPM practitioner skills required geographically to identify the gaps and points of alignment. The article commenced with an introductory background, then presented the overall research method followed by a discussion of the theoretical underpinnings, as well as how the data was collected, coded, and analyzed. The outcomes and observations of the research were then presented and positioned within the current literature.

Apart from offering a highly structured, reusable method for ongoing comparison and realignment of industry and university BPM-related practices, this research offers another important insight that could be used to create future opportunities for BPM-related leadership by universities. More precisely, an Australia-wide survey of BPM practices, conducted by the University of Western Sydney in 2007 [Forghani and Khandelwal, 2007] and involving 111 companies, confirmed the Australian organizations' level of commitment to BPM initiatives being at 49 percent. This was very close to the global benchmark of 50 percent. Regardless that this figure may have changed since 2007, the high demand for BPM initiatives is a golden opportunity for BPM educators to take the lead and shape future industry practices through their BPM-educated graduates. This study's findings provide a basis to this expedition by presenting the most desired capabilities for BPM progression and providing an overview on where the most demand is, where the gaps are, and what other BPM education providers are supplying.

The authors acknowledge the current limitations of the findings presented; even though the research methodology has been designed to ensure rigor and process repeatability, assumptions were made and some limitations remain.

An assumption was made that the online recruitment sites are industry leading and therefore contain the most prominent, if not the majority of, advertised BPM options. The website search criteria (i.e., based on terms related to "Business Process") could have limited the returned search results. The advertised employment opportunities may not necessarily reflect the actual work undertaken by a BPM professional. This study is limited to the results returned from online recruitment sites, unit outlines of BPM university offerings (at a unit level), and commercial BPM training details that were extracted from a Web search. The lack of a standard job advertisement template, unit outline format, and semantic inconsistencies with the recruitment sites' wording may have impacted upon the quality of the results returned via the search criteria. The authors did contact the relevant persons to confirm the content presented in the unit outlines to minimize the impact of these limitations. In terms of BPM-related education offered by training institutions, we also acknowledge that the nature of their training is very different from university education, especially in terms of the expected learning outcomes. Corporate training programs tend to specialize in developing competencies built on extensive job-related experience. Thus, providing training to staff to develop such competencies becomes the responsibility of employers, not universities. We also acknowledge that the basis of our analysis is at a high level of abstraction though necessitated due to the nature of the available data, job advertisements, and course outlines containing only high level details.

Like all qualitative research, the data analysis that took place in this study also has its limitations. The mapping was done predominantly by a single author at a time, where the other authors randomly checked and validated the coding. The text-based coding applied in the study could have been influenced by the coders' perceptions and interpretations of the data (influenced by their prior experience and view of BPM and BPM education), thereby potentially introducing researcher-bias. We also understand that most of these offerings are positioned within an overarching degree program. This means that the program is very likely to have other subjects taught in addition to core BPM that could complement the overall BPM skills and knowledge but also influence the learning objectives of the BPM course itself. However, these course pathways were not very transparent and not accessible to the research team and the analysis presented here took place solely on the information about the content covered within the core BPM offerings.

Some outcomes from this research include the identification of the high demand for BPM capabilities at the Methods and IT aspects [Rosemann et al., 2006]. The skills of process modelling, redesign, and improvement appear to be core to industry requirements for BPM practitioners globally. In addition, the findings presented here can be used by universities and other education providers in the creation of future BPM curriculum, meeting the industry demand for appropriate training. This is the first attempt to map the alignment between BPM education offerings and the required BPM capabilities sought by industry at a national level. While we acknowledge the previously mentioned limitations, the outcomes reported here will benefit academic and industry BPM education providers who may wish to modify their curriculum to meet the demands of industry and prospective graduates to ensure their capabilities meet this industry demand. This will also enable the BPM educators from other geographical regions to reuse our methodology to assess the alignment of their local BPM offerings and place them in the international context. From the BPM industry perspective, practitioners are provided with a view of the capabilities on offer when recruiting staff to BPM-related positions. The findings will also be beneficial to individuals looking for a systematic and in-depth understanding of BPM capabilities and trainings. The article provides a clear methodology to be used when mapping education offerings and industry requirements to an established BPM capability and maturity framework.

This work can be further validated and extended in a number of ways. This study can be replicated by future researchers to derive a deeper understanding (with further detailed analysis) of the connection between industry demand and individual capabilities, in particular by triangulating these findings with other sets of data. The "actual" work completed by BPM professionals needs to be better understood in order to derive better training/education requirements; this can be done through a series of case studies and surveys (to elicit and validate the core tasks

and descriptions of what BPM professionals engage in). Best practice engagement models can then be created, tested, and shared by the community. This study can be replicated in other geographical regions to test the alignment of BPM industry demand and education offerings. Most importantly, it could be used to facilitate further discussion between university and industry by providing a shared framework and the initial set of findings, as intended by this research. Finally, as BPM continues to evolve one could expect new models and frameworks designed to capture our future understanding of BPM-related capabilities to emerge in the not-so-distant future. We envisage that this study could be replicated in that scenario too, as future researchers could follow the research method to a large extent, but use new (yet-to-be invented) frameworks to ground their comparison of the future university and industry offerings.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
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