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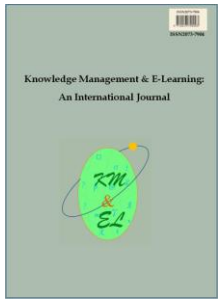

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Improving human performance: Industry factors influencing the ability to perform

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Improving human performance: Industry factors influencing the ability to perform

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Abstract: Learning interventions and new technologies that aim to improve human performance must take cognisance of industry factors inhibiting human performance. The dynamic and fast pace nature of the Information and Communication Technologies (ICT) and the engineering industries do not lend themselves to proper skills planning and management. These industries experience real skills gaps, to some of which they contribute by themselves. This study reports on these performance-inhibiting factors such as the underutilisation of available skills, tolerance for individual preferences, and dynamically, and informally refining a role objective while an employee is occupying a certain role. The important professional skills required by individuals to cope with these real life factors are also explored in the skills gaps management context. Moreover, these industries need a profile they refer to as *Special Forces*, which denotes a high calibre of worker that possesses well-developed professional skills whilst having advanced technical expertise and sufficient experience. This resource profile is required largely due to the poor management of human resource processes in practice and the current reported lack of adequate skills. Furthermore, this study refers to the recent lack of a working definition for these Special Forces leading to the omitted active development of these profiles in industry today, which appears to become a key human performance inhibiting factor.

Keywords: Special forces; Underutilisation of skill; Dynamic role re-definition; Modern work analysis; Professional skills

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1. Introduction

If a prospective employee went through the recruitment and selection process against a defined job specification, the ability to perform the job should be fairly guaranteed. It is further assumed that there is some degree of stability between the job specification and the person performing this job and that although the recruitment process may take long, the outcome should be sufficient to enable the organisation. Some scholars could argue

that theoretical advancement is made in job analysis to address changes in work processes that are much different from those routinely used a decade ago (Singh, 2008; Torraco, 2005). Industry is however still attempting to apply practices stemming from human resource theories of the 1990's. Industry has further adopted alternative, often undefined practices, to deal with the inability to have the right people at the right time. As a result current organisational practices can contribute to creating skills gaps that should not exist.

Organisations may not be acutely aware that certain human resource practices have the effect of enlarging the skills gap. The pressure and speed with which work need to be churned out do not intuitively lead to organisations doing proper skills matrixes and making a concerted effort to redeploy a resource to a role where a larger portion of that person's skills can be utilised.

From initial observation, the organisational practices that may influence the ability to perform in a role include incomplete or out-dated job descriptions; technical jobs that are new and not easily definable; personnel recruitment practices that are not aligned to the actual job requirement; inadequate skills planning to align with future technology adoption; and a misalignment of current and available skills to the required jobs. The effect of these practices is not incorporated into the current reported skills gap numbers and may distort the generally accepted state of the skills issue.

Through industry observation it is evident that organisations often require an employee to assume a role that the employee was not originally employed for. The reason for this assignment is often not consciously made. It appears to result from crises management but often also initiated by the resource itself where an opportunity exists for learning new skills, or as a general positive team attitude. The job needs to be done and the employee is motivated to figure it out, thus inherits the job. Once this job is assumed, there is very little formal intervention to re-asses the sound assignment of work.

This article is the first in a series of articles taking a critical view on the skills gap debate from an industry perspective. The articles are based on a doctoral thesis that questions the current reported skills gaps for their true size and shape. The objective of the doctorate is to develop a model of factors influencing industry's experience of skills gaps in order to derive a more accurate and complete working definition of skills gaps to validate interventions aimed at alleviating these skills gaps. The study is done in an engineering discipline. The study does not address engineering education and training practices, but rather attempts to understand the industry reality in which graduates and more seasoned employees need to function.

This article reflects current academic work that describes the skills that are required by industry to address the perceived skills gaps. It also reports on initial field research to understand how skills gaps manifest in organisations. An attempt is made to reconcile industry-required skills as described in the literature with the skills gaps as manifested and observed in the fieldwork. The fieldwork is done in South Africa where current labour legislation may contribute to some of the skills concern.

2. Skill gap management

Organisations struggle to balance a low number of adequately skilled human resources with an ever-increasing number of complex jobs to be performed. This shortfall in skilled staff contributes to an industry wide concern of skills gap management. A shortage of skilled resources is technically a *skills shortage*. The term skills gap as used in industry

refers to both the shortage of certain skills as well as the absence of skills in the individual that is assumed to possess these skills.

A skills shortage is defined as "deficiencies within the labour pool, which creates problems in recruiting new staff caused specifically by the shortage of individuals with the required skills in the accessible labour market" (Frogner, 2002). These skill shortages can also be contextualised in terms of new or modern jobs to be done for which there may not be enough skills available, an example being waste management of chemical and electronic materials, which require engineering skills (Whitmore, Llewellyn, & Smith, 2010). Skills shortage is one of the components of the skills gap concern, especially in the engineering discipline where too few formally qualified engineers enter the market.

There is however a perception that available resources with the required education and training may lack specified skills to complete the job. Skills gaps refer to deficiencies in the skills that employees need to carry out certain tasks. A skills gap is defined as "a disparity between the quality and adequacy of skills possessed by an individual and that required by industry" (Scott, Alger, Pequeno, & Sessions, 2002). The emphasis on skills gaps is on the action of doing the job, not the theoretical knowledge the engineer may have. The gap is thus stated as a shortfall in performance delivery. There is consensus that employees are not equipped to deal with the demands of modern jobs (Stephens & Hamblin, 2006; Scott, Alger, Pequeno, & Sessions, 2002; Martin, Maytham, Case, & Fraser, 2005; Meier, Williams, & Humphreys, 2000; Hart, Stachow, Farrell, & Reed, 2007).

Current academic efforts emphasise the need to develop or improve non-technical skills. Employer dissatisfaction with graduate employee skills for instance can be attributed to the underdevelopment of personal transferable skills and the recognition of graduates of their weaknesses in these skills (Humphreys, Lo, Chan, & Duggan, 2001). It appears that organisations rely substantially on well development professional skills such as communication, problem solving and interpersonal skills. It is perceived in industry that this reliance compensates for the lack of *I know how to do this in favour of I can figure this out and make it happen*. To this end, education curricula have been extended over the last ten years to include professional skills development in an attempt to make new graduates more adaptable to industry demands. There is a cluster of research in developing engineering profiles, attributes and performance expectations, which have resulted in criteria to guide educational outcomes. The Accreditation Board for Engineering and Technology (ABET) accredited these criteria (Earnest, 2005; Shuman, Besterfield-Sacre, & McGourty, 2005; Passow, 2007; Woods, Felder, Rugarcia, & Stice, 2000; Davis, Beyerlein, & Davis, 2005).

This education intervention does not seem to respond to industry's on-going concern with skills gap management, as there is hardly a sudden rush for newly graduated engineers. The majority of academic work in the skills gap debate use mostly informal interview techniques to establish industry skills expectation. Employer perceptions of skills gaps in retail (Hart, Stachow, Farrell, & Reed, 2007), engineering graduate's perception of how well they are prepared for work in industry (Martin, Maytham, Case, & Fraser, 2005) and the skills gaps observed between information systems graduates and the System Development industry (Scott, Alger, Pequeno, & Sessions, 2002) are examples of the superficial industry skills expectation assessment that informs skills development effort. There is not enough industry research to identify the modern context of engineering job definition that informs the skills expectation as a basis for determining the actual skills gap, nor on the industry compensating practices that have become part of the organisation culture and its operations. It is necessary to obtain a more complete

picture of the industry factors that lead to organisation experiencing or perceiving inadequate skills. Our inability to manage skills gaps properly may stem from the lack of a working definition for a modern job.

3. Theoretical advancement in work analysis

An important element that supports this study is the recent advancement in the job analysis theory that critically evaluates the analysis practices that produce job descriptions and job specifications. This work extends this approach by including a description of modern work.

3.1. The history of job analysis

The methods used to analyse jobs come from time and motion study work done by Frederick Taylor early in the 20th century to select and motivate employees in an attempt to increase efficiency. Taylor used job analysis specifically to select, motivate and train personnel. Job analysis became a practice used in the initial studies into selection and placement as well as supervision and efficiency studies that followed (Singh, 2008; Morgeson & Humphrey, 2006).

In the 1950-60's management studies revisited job analysis practices to understand job enlargement and rotation needs. During this period division and specialisation of labour become important and in this sense job analysis became an important management tool in business. Industrial engineering had a significant impact on the job analysis in a bid to increase productivity and streamline the division of labour and the subsequent specialisation of labour. Job analysis received a renewed focus in the 1970's to serve a wider variety of organisational needs such as staffing, change management, training, performance appraisals, compensation, employment equity and affirmative action (Levine & Sanchez, 2007).

The job analysis resulted in a job description (JD) that gave a complete list of tasks and outputs with time and performance indicators where applicable. The traditional approach to job analysis indicated the jobholder as the provider of job related information with the immediate supervisor doing the validation and adding perspectives (Levine & Sanchez, 2007). The objective of the traditional job analysis was to have an accurate and complete description of the job itself and the tasks to be performed. Unionisation and legal battles with employees relied on a sound job analysis to assign fair work demands and compensation and provide adequate opportunities for training, development and promotion. Job specifications (JS) followed which described the characteristics of the person doing the work; they may include characteristics of any equipment or environmental factors that must be present to complete the job, such as specialised engineering or manufacturing infrastructure. Both the JD and JS were required for human resource processes such as recruitment and performance appraisals.

Theoretical advancement in 1980's contributed to the development of various job analysis and position questionnaires that helped human resource practitioners gather data related to jobs for purposes of remuneration, promotion and performance management. Instruments such as the Position Analysis Questionnaire and the Critical Incidence Technique were, and still are, being used frequently to get an accurate and complete as possible view of a specific job. Closer to the end of the century job analysis theory was well established in creating stable job descriptions, which included re-useable components in the form of job families. O*Net is a good example of a dictionary of

occupation titles and associated job description using family structures (http://www.onetonline.org).

The success of O*Net is based on a number of assumptions including:

- The job and individual match is stable over time;
- If much effort is spent, the job description can be accurate and complete;
- Current and past job information is available to define the job;
- There is a one to one relationship between the job and an individual holding the job;
- Job boundaries are fixed with clear handovers between jobs;
- Job descriptions are static and valid for a long period of time;
- Hierarchies of employment and promotion are followed.

Organisation design theory of the 1980's advocated the specialisation of labour and subsets of tasks given to multiple employees to contribute to the final product. Employees seldom cross boundaries and inter job activities did not exist. There were clear boundaries between jobs with handovers that were easily observable. Organisational design theory further suggested that the organisation consisted of positions that can be defined and designed independent of the people filling them. There was also a clear division between labour and management that defined who did the work and who monitored and managed the work. This division in roles discouraged people to take on responsibility that was not in their job description.

3.2. Changes in job behaviour

The traditional approach to job analysis is still governing most of the human resource management (HRM) processes although the approach and methods recently came under attack for not being relevant to current organisational concerns (Morgeson & Humphrey, 2006; Sanchez & Levine, 2000; Singh, 2008; Torraco, 2005). The criticism raised against the traditional approach ranges from questionable and inaccurate information being provided to the information, once it is available, being obsolete thereby suggesting that the process takes too long to complete or may lack the context within which the job is to be performed. The behaviour of jobs in modern organisations is changing and the underlying assumptions listed above do not hold anymore.

Stable, static jobs are characteristic of long production cycles in mass production and large markets. This assumption does not hold for a modern service organisation. Static jobs, especially in manufacturing also allow for the observation and time taking of related tasks. These jobs can be analysed through surveys. The traditional job analysis is not suitable for service-oriented jobs where employees often go beyond their stated job description.

Employee responsibilities are broadened and boundaries between jobs are becoming less distinct (Levine & Sanchez, 2007; Singh, 2008; Torraco, 2005). Work has become more dynamic; fast paced, and with many inter job activities. Self-directed work teams do the work. There is a blurred line between labour and management with increased interaction across functional and national boundaries. Due to flatter organisation hierarchies and global financial economic changes there are limited career advancement opportunities. There is a tendency towards shorter rather than longer-term employment and the creation of jobs that did not exist before (Levine & Sanchez, 2007).

Modern employees change and adapt to work demands and have more freedom to express personal preference for certain work or work situations (Singh, 2008). These personal changes cannot be captured by the traditional organisation structures. The employees further operate on a number of work relationships with other employees that cannot be incorporated into a ridged organisation structure or be embedded in processes and procedures. Individual performance becomes less important than the ability to develop and maintain relationships throughout the organisation on which the employee relies to help him/her to get the work done.

A more modern take on the job analysis practices recommends a broader scope of the job analysis as work analysis to encapsulate changes in work demands; the scope of the work to be done and the changing nature of team processes. Recent research considers work analysis as a set of tools intended to facilitate the inferences regarding important aspects of the work tasks and specifications that should form the basis of the HRM processes. The consequences of the work analysis and how the work analytical data is used in the organisation become more important than an accurate and complete description of the job. The output of the work analysis is not directly used to make decisions about the employee but rather to suggest interventions and practices to improve people and process change in the organisation (Levine & Sanchez, 2007).

A work analysis practice is required for teams. While the job activity analysis is still very important, a wider perspective that integrates inter job activities is becoming vital (Singh, 2008). Dynamic and self-managed work teams are responsible for the work delivery. The work is assigned to the team and the team members determine among themselves who does what work based on individual skills and preferences. Individual tasks are thus not formally assigned. Individuals have a better opportunity to learn and apply different skills. This situation requires key performance indicators (KSIs) for team-based processes such as task coordination, customer service, participation, communication, conflict resolution and problem solving. A set of generic skills may serve such a team well. Generic or professional skills are skills that are required for longer periods while specific technical skills are situation based, for example the adoption of new technology for which specific technical skills and knowledge is required at a defined point in time.

An approach that may be more beneficial to organisations is to look into competency-focused work analysis rather than the traditional job and KSIs. In this approach an organisation would staff itself with high calibre individuals that form the basis of the future capability rather than a pool of historic core competencies. High calibre people would have competencies such as interpersonal skills, conflict resolution skills, innovative thinking, flexibility, self-motivation and decision making skills (Singh, 2008). In the engineering education and engineering management literature relevant to this study these same skills are identified as the foundation of the ideal engineer. This tie back closely to the ABET accredited profile of the engineer (Earnest, 2005; Passow, 2007; Davis, Beyerlein, & Davis, 2005). The initial fieldwork reported later in this article reflects the industry confirmation of this need for a higher calibre person. Industry refers to higher calibre persons as *Special Forces.*

4. A view on industry required skills

It became apparent during the initial review of engineering skills gap literature that there is an emphasis on the need to develop professional skills. An open coding exercise on Atlas.ti of academic articles rendered a number of professional skills that are required.

Since this research thesis does not focus on engineering education and the content of curricula, reference to technical skills development was excluded from the coding exercise. The term professional skill is used to include soft skills, personal skill or non-technical skill and is done to align to the ABET criteria for the engineering profile.

A few of the often-occurring professional skills are discussed below. This is not an exhaustive list but it serves as a background to contextualise the field observations. The importance of the integration of the academic work and the field observations is to understand why industry is expecting certain well-developed professional skills. The required skills that stood out during the coding are Communication, Life long learning, Multi-disciplinary team (work as a member of), Problem solving skills, and Attitude.

The professional skills in general are very seldom well defined in the literature. The reader can determine the meaning from the context in which these skills are referred to, however, there are also a number of occurrences where professional skills are merely listed, assuming the reader knows that communication skills for example refer to the ability to transfer technical knowledge to a listener that has the technical foundation to decode the message.

Another shortcoming in the contextualisation of the professional skills development requirement is the practice of identifying the expected skills from graduate student's self reports or through industry surveys (Scott, Alger, Pequeno, & Sessions, 2002; Martin, Maytham, Case, & Fraser, 2005). These are mostly qualitative studies reporting on the perception of the student's readiness to function in industry from which inferences are made regarding the adequacy of their skill sets. In Scott et al's study, the students rated themselves as adequately skilled in professional skills while being more qualified in system's design, system's analysis and business process re-engineering skills than what the study believed industry needs. While it is not disputed that engineers are well trained and prepared technically as well as mentally to apply themselves in industry, this confidence of skills adequacy may stem from technical mastery in a protected environment and not necessarily from the understanding and appreciation of a real world challenge. Stephens and Hamblin (2006) refer to a "snapshot of perception" as these annual skills surveys can best capture what industry experience is lacking at that moment and there is evidence of substantial skills need variances with no apparent bases for the differences reported year in and year out. Skills gap definition and measurement practices require a refinement. Sutherland (2009) drew comparisons between days of training received and perceived competence on the job. This study found little evidence of actual skills gaps and more evidence of underutilised resource capabilities.

4.1. Communication

Communication skill is one of the most commonly occurring references to professional skills (Martin, Maytham, Case, & Fraser, 2005; Nguyen, 1998; Shuman, Besterfield-Sacre, & McGourty, 2005; Meier, Williams, & Humphreys, 2000; Hart, Stachow, Farrell, & Reed, 2007). In general, it calls for the ability to communicate effectively. Factors affecting the ability to communicate effectively include practice and confidence but more importantly the ability to convey technical knowledge. The emphasis on the ability to communicate technical information suggests that the communication skills requirement has a deeper meaning than initially assumed in the many articles that merely list the skill as one of the important skills to develop. Communication consists of a coding and decoding of a message and the assumption that the listener can actually decode the intended message. A more focused review of communication skills development is

required to see if this aspect of communication has been researched in an engineering environment.

It also appears that communication skills are required to build relationships. During the review of the work analysis literature the importance of individual relationships was highlighted as necessary to get the job done. The development of relationship currencies relies on the ability to communicate effectively and with confidence (Martin, Maytham, Case, & Fraser, 2005). Here again, the need to develop communication skills does not focus on the ability to articulate oneself properly but rather to know what to communicate to whom, and when to do so.

Information sharing was found related to communication skills. Listening skills were mentioned but not definitively defined to include the ability to decode the message or the decision related to the correct content and nature of the communication that should be done (Martin, Maytham, Case, & Fraser, 2005; Stephens & Hamblin, 2006). Interpersonal skills appear to encompass communication skills, sharing of information as well as the cooperation with others (Martin, Maytham, Case, & Fraser, 2005; Nguyen, 1998; Woods et al., 1997).

4.2. Life long learning

A sample of articles considering the need to have a positive attitude or commitment toward life long learning surveyed university graduates on their perception of their preparedness to work in industry (Martin, Maytham, Case, & Fraser, 2005; Nguyen, 1998; Shuman, Besterfield-Sacre, & McGourty, 2005; Meier, Williams, & Humphreys, 2000). For this study sample the reported achievement in learning and willingness to continue learning will be high. If the same assessment was done amongst seasoned workers, the attitude towards life long learning could look much different. The research in life long learning points to the ability to recognise the need for learning, and the ability to engage in such learning. It also requires the commitment to continue with this learning beyond the achievement of formal educational outcomes. Life long learning is not explored for the type of learning or the frequency but is always positioned in context of staying current with regard to technology knowledge and awareness of changes in one's environment.

Life long learning is positioned as the ability and motivation to adapt, presumably to new technology and ways of doing things. This is not always pertinently stated. This study did not find much research considering the motivation and success of life long learning in older employees. It is clear in the industry observation why it is important to stay current with regard to technology changes as the absence of current technology knowledge prevents an employee from delivering.

Life long learning also includes the ability to apply one self, which again suggests that the need to learn and stay current is required to be able to solve current problems. Problem solving is discussed further down.

4.3. Multi-disciplinary teams

Multi-disciplinary teams are positioned as a skills need that organisations have. This skills need refers to the ability to function as a member of a multi-disciplinary team and not multi-disciplinary skills within one individual although Meier, Williams, and Humphreys (2000) allude to this definition for multi-skilled people. Multi-disciplinary can either mean a team that is made up of people representing different disciplines such

as chemical, electrical and mechanical engineers or people from different levels in the organisation such as operators, technical officers, engineers and managers (Martin, Maytham, Case, & Fraser, 2005; Nguyen, 1998; Shuman, Besterfield-Sacre, & McGourty, 2005; Meier, Williams, & Humphreys, 2000).

When the ability to work effectively as a team is further analysed, the skills discussed above such as communication skills, information sharing, cooperation, and the willingness to learn and stay current with technology change are the core skills necessary to function in either category of a team defined here. Students can certainly be given practice to deliver in a team to develop the awareness of cooperation and effective communication. How do we develop the ability to function in multi-disciplinary teams for Generation X or Boomers in technology organisations?

Meier, Williams, and Humphreys (2000) refer to multi-skilled people as those that are not narrow focused engineers or semi-skilled operators. Industry observation suggests that the definition of a skilled worker is context specific, hence, it may be possible that narrow focused could mean that the person is allowed to exercise the opportunity to engage in a preferred work only or in the case of a semi-skilled worker, the person is simply not skilled to do the job. It has little to do with the fact that the worker is expected to have more than one set of skills, for example a technology project resource that has both business and data analytical skills while also being apt at doing solution regression testing. Multi-skilled is not defined in the context of modern jobs.

4.4. Problem solving skills

Problem solving skills saturated quite quickly in the open coding exercise and refer to the ability to resolve problems as presented in the practice. Problem solving is described as a required skill in the literature. It is believed that problem solving skills can be taught and should be included in curricula. The need to teach these skills comes from a perception that students became collectors of sample solutions who attempt to solve a new problem by patching together parts of previous solutions. Woods et al. (1997) define problem solving as the process of obtaining the best answer to, or the best decision subject to some constraints as students should be taught how to scope and sectionalise a problem so that they can arrive at novel solutions to address the problem. While many authors to problem solving skills either just listed them as a requirement or added some context to suggest that they may include or rely on good communication and interpersonal skills, Woods et al. (1997) properly summarised the attributes of problem solving:

- Being aware of the processes used to scope and sectionalise a problem;
- Using pattern matching to quickly decide whether a situation is a problem or an exercise;
- Applying a variety of tactics and heuristics;
- Placing an emphasis on accuracy (as opposed to speed);
- Being active by writing down ideas, creating charts and figures;
- Monitoring and reflecting on the process used to resolve sections of the problem;
- Being organised and systematic yet being flexible (keeping options open, seeing the situation from many different perspectives and points-of-view);
- Drawing on the pertinent subject knowledge and objectively and critically assessing the quality, accuracy and pertinence of that knowledge and data;
- Being willing to risk and cope with ambiguity, welcoming change and managing distress;

- Being willing to spend time reading, gathering information and defining the problem (as opposed to equating problem solving with "doing something" despite its pertinence); and
- Having an overall approach that uses fundamentals rather than trying to combine various memorised sample solutions.

This summary of problem solving attributes reflects many of the attributes that industry identified for its Special Forces profile. It is unlikely that problem-solving skills represent a singular set of skills that could or should be taught. The degree to which these skills may comprise personality attributes, motivation and technical foundation competence has not been addressed in current problem solving literature.

4.5. Attitude

Attitude appears regularly as a high-level skills requirement but more often it is embedded in something more specific. Concepts such as approachability, commitment, conscientiousness, flexibility, integrity, functionality, reliability, tolerance, and willingness all point toward having a positive work attitude.

Hart, Stachow, Farrell, and Reed (2007) refers to young workers in the retail industry as having an attitude gap. This reference attempts to capture the younger generation's lack of motivation and passion for a seemingly menial job such as working in a clothing store. Should the lack of a positive attitude be considered a skills gap and if so how is a positive attitude to be trained? The personality attributes contributing to a positive work attitude may rather be personality traits that should be recruited for and enabled through organisational practices and polices geared toward harmony and constructive contribution, rather than attempting to intervene in professional skills development aimed at changing or instilling a professional skill.

5. Initial observations from field research into skills gap manifestation

The objective of this Section is to report field observation with regard to how skills gaps are manifested in industry. This Section describes what happens and how it happens, rather than doing questionnaires or interviews with industry leaders to ask what skills they think are required. It commences with an overview of how the ICT and engineering industries look at talents, good skills and bad skills. The Section concludes with a report on a number of organisational practices that contribute to the ineffective use of human resources skills.

This fieldwork focuses on the engineer involved in technical tasks at execution level. This can be work done either in a project such as the design, development and implementation of Service Oriented Architecture (SOA) and Master Data Management (MDM) or work in the IT and Telecommunications Network Operations, which is characterised by more stable and repeatable processes. The fieldwork done to date involves observations and unstructured interviews. This data was analysed for recurring themes using the open coding method on Atlas.ti. The following concepts emerged frequently as characteristics of an organisation experiencing skills gaps.

5.1. The good people and the bad people

A critical observation from the field is "when the work to be done is beyond the ability of the ordinary guy, call in the Special Forces" (J. C. Cardenas, personal communication,

August 28, 2012). Special Forces is a term that occurs frequently at different research sites and closely resembles the ideal profile of a modern worker as depicted in the literature. The term refers to a group of people with the right skills that are available at the right time. The challenge that exists with the *right time* is a function of their current workload and their availability to help with other work. This core group of people is often over utilised and seldom take long leave. Over utilisation occurs when the same core group of people is frequently required to be involved in all the important work to be done. It is a group of people that are perceived to be able to do anything that is given to them. Calling in the Special Forces is a practice that provides comfort to the executive team that the work will be done correctly and on time.

Members of this Special Force appear to have the following attributes:

- There is completeness in their output;
- They are methodologically comprehensive and thorough;
- They show a comprehension and appreciation for the scientific foundation of a given problem;
- They are able to correctly scope and sectionalise a problem. They are often the initiators of tasks that have not been foreseen or included in job descriptions;
- They can present options to a solution as well as the implication of each solution selected;
- They are well prepared before offering solutions and can demonstrate the result of a self evaluation prior to the presentation;
- They show creativity that is not negatively affected by pressure or short timelines;
- They can tie the solutions back to the original scope;
- They can move quickly between different objectives and therefore, are ideally suited to dynamic assignment to work;
- They observe engineering practices and can balance between creativity and observing tried and tested methods. They do not try to re-invent the wheel.

It appears that a Special Forces team is put together for specific jobs. Singh (2008) describes the need to move toward employing this calibre of persons as the basis of the organisation's talent. This is not how it is currently implemented in industry, as it is still very much a scurry to find this profile of person to assign to work tasks.

The process through which the Special Forces deliver appears to be consistent. They are assembled either by an authority figure that in a moment of crises, pulls all stars off other work, or the team establishes itself when the pressure is not that great and there is time for sense making and learning. The latter unfortunately seldom have the opportunity to remove a non-special force person from their ranks.

An interesting interview comment in connection with Special Forces is that very little work remains in high technical environments for the unskilled. The work left only requires this Special Force profile.

There is evidence of an opposite skills profile in the industry. This profile is called a *Floater*. A Floater is described as a person that is re-assigned often but not really capable and cannot be given a task to complete without being assisted or micro managed. This person re-invents the wheel because of not knowing the practice. This person does not complete the task, and the work that is delivered does not address the full problem. During two interviews, observations were made about people working on software

development tasks without the aptitude to do software development. As a function of internal re-assignment of resources, spare capacity is re-allocated without the required skills assessment. Underutilisation due to underperformance in the current position could result in this re-assignment and contribute to the perception of a resource being a Floater.

The organisation's inability to swiftly deal with Floaters contributes to the creation of skills gaps as the Floater occupies a role or fills a head count that could be used for someone more skilled. Organisational training and development initiatives often target this profile. This profile is also more likely to make use of training offered as they have less work pressure and can commit to training days.

Floaters are more prevalent under permanent employees than contract resources where the duration of floating can be shorten by terminating the contract. It is more difficult to address a floating issue if it is a permanent employee. These observations are made in South Africa where the labour legislation requires that an employer can provide proof of training and development, coaching, mentoring and redeployment assessments before terminating an employment contract because of redundancy or non-performance.

5.2. Organisational practices contributing to the ineffective use of human resources

During the fieldwork a number of organisational practices were identified that made ineffective use of human resource capacity and capability, thus contributing to the perception of skills gaps in industry. These practices and how they contribute to aggravating the skills gap issue are briefly described below.

5.2.1. Underutilisation of resources

Underutilisation of available skills appears to be the major industry contributor towards the creation of skills gaps. Underutilisation occurs when a resource is assigned to work that does not fully use the time or skills set that the resource offers. Underutilisation of time, or capacity, is a function of poor planning and resource management. Idle time happens frequently especially in project context and requires active rescheduling or the smart use of such idle time between project dependencies. Slack human resource management processes associated with informal work practices allow for resources to be less productive than what they could be. This equates to a disparity between the performance delivery expected for the number of resources assigned versus the actual performance delivery achieved. Industry leaders perceived this disparity as the result of skills gaps and not as the result of poor resource planning or management.

Underutilisation further occurs when a resource has skills to offer but these skills are not actively incorporated. In the first instance, the resource planner or line manager is not aware of the skills. A skills matrix and valid personal development plans (PDP) do not exist. In observations at two organisations the PDP's were completed but were in both cases completed for permanent employees only and by the employees themselves without an active involvement from the line management. This research has not yet identified a PDP practice that was aligned to a resource plan, which in turn was aligned to the organisation's strategic objectives.

Secondly, underutilisation may occur when a resource may not be transferred to another team. There is conscious knowledge of a misalignment between the skills need and the skills on offer within a team, but due to policy or practical constraints such as a

head count freeze or personal preference (both concepts discussed later in this section), the skills alignment cannot be attained.

Skills obsolescence was observed in three instances in technology resources that did not stay current with technology changes. Skills obsolescence contributes to situations of underutilisation and thus, to the perception of a skills gap. In all three cases, the resources were contract resources that did not stay current but did not realise that their skills were outdated. In one case, the person was with the same company for over five years, doing the same job. The other two contract resources had a career history similarity characterised by very short assignments with prolonged periods of no employment.

Poor vendor management contributes to the creation of skills gaps and the occurrence of Floaters. Organisations often engage with a selection of preferred vendors to provide contracting resources. The line manager, or other company representative, engages with the contract house to provide job descriptions for vacancies and would typically be the first level of a candidate selection. This engagement is based on the assumption that the contract house will do the necessary checking in terms of the adequacy of skills, experience and qualifications and that the account manager understands the specialised skills that are required. In two observations, the qualification was fraudulent and the resources could articulate the work to be done but did not have actual experience in doing it. Organisations often only do skills and experience verification for their permanent employees, not for contractors. The organisation assigns work to the contractor on the assumption of certain hard-core technical or science skills, which the contractor may not have and can thus not perform or deliver.

5.2.2. Head count freeze

A headcount freeze contributes to the creation of skills gaps when a known skills requirement cannot be filled due to the unavailability of an opening in the organisation structure. The concept of a head count freeze results from the practice of defining an organisation structure and staffing it with permanent and contract personnel. This is different compared to not having the funding to recruit a contracting resource. There is literally a cap on the number of people that may be employed, permanently or on contract, in a specific department.

Changes to the headcount and the specific roles that were approved in the initial organisation structure are difficult to incorporate. When the contract portion of this staffing method is utilised there is very little room to replace or exchange skills. The manoeuvrability to deal with changing demand is in the ratio of permanent to contract resources and the relationship with the contract houses to replace skills and get the replacements up to speed in the shortest time possible.

In the event of an organisational unit being staffed with permanent personnel and these people do not have the required skills, replacement is somewhat more difficult and ultimately leads to skill decision making that is not aligned with the skills requirement such as a Floater that moves around the department for years.

5.2.3. Degree of tolerance for personal preference

The workplace is becoming more tolerant of individuality and personal preference. Individual employees are allowed to exercise a freedom in selecting which activities to do and when to do them. This freedom is often allowed beyond what is necessary to enable the work to continue and may affect the basis on which performance management

is done. In two observations, the individual employees were required to travel to another location for technology design work. The employees were not prepared to travel, not for the sake of the cost involved that will not be reimbursed but because of the inconvenience caused to them personally for arriving home later or being caught in afternoon peak hour traffic.

This example contributes in two ways to the organisation experiencing a skills gap. Firstly, the employee is not delivering, as he did not attend a design meeting of which the outcome would have informed a portion of the technical solution. This behaviour could be classified as a willingness and attitude problem. Secondly, the team that continues with the design work has to compensate for the lack of a skill that could have added benefit. This team is experiencing a challenge in completing the work and as a result it may report a skills gap when adequate skills were available in the organisation.

5.2.4. Insufficient self learning

There are ample examples in industry of human resources not able to assess that they need to learn new technologies and methods and actually engage in that learning. This tendency to neglect self-learning responsibility was evident in both permanent employees as well as contracting resources. Contracting resources refer to resources obtained through labour brokers and exclude consulting houses contracted to deliver a turnkey solution.

In lieu of solid technical skills and sufficient experience, the individual assigned to an unfamiliar task needs to go through iterations of learning. It appears that learning takes place in cycles of sense making, integration and application. This observation needs to be analysed in terms of learning methods, which was not in the immediate scope of the initial fieldwork. This cycle however appeared in all the observations and appears to have significant value for further research. An intervention to try and speed up this learning may not be successful due to it being confused with classroom training. Learning of the nature required making sense of modern technical challenges and going through the self-awareness and critical evaluation stages cannot be simulated in a classroom setting.

We don't know what we don't know until we know it. The size and frequency of the learning cycles depend on how far in the future the individual can see. The reliance on self learning and critical self evaluations seems to point to the ability to realise that only a subset of the whole may be visible and understood at any given time. A skill highly in demand is the ability to be aware of this incomplete vision and to actively look for the rest of the whole, whilst being willing and motivated to repeat the learning iteration.

For the planner and manager of these cycles of learning the challenge is presented in the number of team members that need to go through these learning cycles as the scope and depth of each cycle will differ per team member. This gives meaning to a required managerial skills set of people skills. The reference to people skills in the literature leaves the impression that it is the ability to *work* with people. The engineer as manager is required to assess not only the degree of learning required by each team member, but also the optimal learning environment per individual, the speed of learning and the collective maturity after each cycle. The collective maturity increase determines the scope and depth of the next cycle.

Lack of formal education prevents a person of identifying the need and the area for further or continuous development. The attitude towards learning is also vital as it

was evident in the two contract resources that became underutilised due to their skills not being relevant anymore. Neither of these contractors had formal technology qualifications and both saw further education as class room education that did not suit their current lifestyle and financial means.

5.2.5. Dynamic role re-definition

There is a tendency in industry to not pay attention to the definition and subsequent implementation of a role. A job title is selected and people assigned without checking the shared understanding or meaning of the role definition. In practice, the definition of the role may dynamically change, as it is needed to encapsulate the change in the work requirement.

In the case of a Business Analyst (BA) role, this role could mean the person responsible for eliciting requirements from the end users, collaborating with other business analysts to define complete business and functional requirements for system changes or re-engineering business processes to optimise workflow. The engagement is mostly with end users who have very little technical knowledge and who would state a problem in an operations perspective. This BA role would also be instrumental in an organisational change management, as the holder of this job would have a close relationship with the user.

O*Net (http://www.onetonline.org) does not have a job description for this BA role described above but includes it as a role title in their description of a Computer System's Analyst (CSA), although their job description of the CSA does not do the end user type work. In industry, both of these BA descriptions are valid and only a concerted effort to formally acknowledge and communicate the definition adopted by the organisation can prevent the creation of a skills gap that would otherwise exist. Those with knowledge of the BA role definition above would not be skilled in doing the technical specifications required by the CSA role. The CSA role again would not have the end user engagement capability. When this differentiation is not understood at a managerial level, the organisation may be staffed with end user engagement type BA's when the O*Net CSA type BA's are actually required to effect the technology roadmap.

Promotion practices can also contribute to a role re-definition as the role takes on a meaning based on the personal attributes of the person occupying that role. Promotion often happens based on tenure or the closest internal match rather than going outside for candidates. A role may also be created for a star performer that brings value to the organisation in a time of need. In several observations the employee did different work to what the JD specified for the role. Two observations are made in context of these promotion practices. Firstly, promotion based on tenure gives no guarantee of an actual fit to the role and may lead to a Floater with the right attitude being appointed to address a short-term need. Secondly, there may be a self re-enforcing concept of no talent to recognise talent. If a person is promoted beyond his/her ability then he/she is not able to recognise skills available within the department.

The disparity in the performance delivery when the incorrect definition is adopted would lead to a skills gap being perceived. The managerial inability or unwillingness to do the proper performance management may stem from this dynamic change in the role definition. The result of performance management is often a general appraisal based on the attitude and client satisfaction and not the actual technical performance, which may account for the skills requirement of a positive attitude. A positive attitude points to the willingness and ability to deal with this dynamic role definition changes.

5.2.6. Role conflict

A role conflict contributes to the perception of skills gaps. Due to the haphazard assignment of resources to tasks, it is not always clear when a person is responsible or accountable for a certain output. This assignment could be done by the management or it could be self initiated as in the case of a team member realising a task is required that was never defined and included in the overall delivery plan. This lack of clarity leads to an inconsistency and incompleteness of the overall delivery that leaves the impression of an immature team lacking basic delivery skills. This is more prevalent in a project context than an operations context where there is a tendency to employee on a permanent basis with more formal job descriptions that capture recurring activities.

A role conflict requires well-developed communication skills to stay aligned with regard to the changing scope of the work to be done as well as the role changes that may occur as the team members make sense of what the job actually requires.

5.2.7. Scoping and sectionalising a problem

The academic observation on the need for problem solving skills points firstly to an inability to accurately scope the problem. A general shortcoming in the current industry skills set is an ability to correctly scope the problem that needs to be solved. Organisational practices in the ICT industry as well as the engineering industry are not always geared toward actively assisting with the scoping and sectionalisation of problems. The adoption of a formal project methodology or engineering practices such as instrumenting software design that could help to guide problem identification and resolution are not always well implemented or enforced.

It is very often assumed that the person scoping the problem has the technical foundation and previous exposure, if not repeated experience in the area mentioned. A frequently occurring skills gap problem is the inability to grasp the nature of the work to be performed. This uncertainty often presents itself as *the problem*. It may not be a problem for a technically skilled and seasoned person. It becomes a problem when these skills lack. While higher levels of engineering may results in a decent challenge for a trained and seasoned engineer, problem solving in industry often takes the form of mid level engineering challenges that are presented to unskilled and inexperienced resources.

6. Conclusion

There is no debate in industry with regard to the shortage of skilled resources. Industry knows this and needs to compensate for the lack of hard-core technical skills through sometimes-ingenious ways to get the job done. This article reflected on a selection of these attempts to cope as well as the side effects that an ill planned or impromptu resource allocation may have on the actual experience of skills gaps in practice.

There is a reliance on well-developed professional skills. These skills are required to help make sense of difficult technical tasks and to cope with the demand to adapt to often ill defined, and dynamically changing, working environments. While professional skills such as communication and interpersonal skills can be taught, learning and development interventions to stimulate self-development and learning motivation in individuals may be required, especially in more seasoned employees. There is evidence in the South African market of a perception that learning is classroom based. Practical learning is not formally defined as an ‘on the job’ activity and herein lies a golden

opportunity to make learning meaningful, practical and convenient especially for experiential learning in context of the ever increasing speed of modern technology uptake. E-learning simulations can encompass this technology sense making learning. It may however be more advantageous for on the job learning to receive more structured attention, although it is perceived to be more costly.

The profile of the Special Force person as defined in this study is a combination of technical expertise, sufficient experience as well as a degree of professional skills to round off the skills set offered to the employer. The challenge for further skills development is to find the balance between the technical expertise and well-developed professional skills. This balance may be contextual or industry specific. This balance is further disturbed by poor organisational practices that make ineffective use of otherwise suitably skilled resources. Learning interventions must take cognisance of these influencing variables when defining learning objectives and outcomes. Organisational learning interventions must further target organisational awareness of poor business practices that contribute to the ineffective utilisation of available resources.

Personal development plans were found to be inadequate. The industry required skills are well researched, however many individual employees do not assess themselves against this expected skills set and do not follow an active self-development and learning plan. The Human Capital divisions of the organisations interviewed did not consider these PDP's to be valuable tools to build an inventory of available skills. The visibility of PDP's can provide a more complete view of the talent available in the organisation and help alleviate the pressure of finding suitable skills at short notice that often results in misallocation of resource capabilities. It is possible that the organisational change to adopt these PDP's may be more successful if this is driven from a personal perspective rather than attempting to change HRM processes. Individuals are already building public profiles and personal value propositions in lieu of the traditional resume.

Skills gap management is not only an education issue. The employer has a role to play too that requires organisational changes to support and enable learning technologies. Individuals taking charge of their professional skills and actively developing and promoting these may also help change the perception of a larger than real skills gaps issue.

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