Developing Competencies and Graduate Attributes relevant to the Discipline of Simulation

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Abstract.

What would you include in a list of essential capabilities, knowledge and competencies for those working in simulation? Would you focus on one industry stream [e.g. engineering] or look for the highest level of abstraction shared by all possible simulation contexts? Would you focus on simulation ‘roles’ or simulation ‘tasks’? Would you begin with a ‘teaching’ ‘learning’ or ‘capability’ focus? As these questions being to unfold it become evident that there are many more questions like these. This paper reports on progress towards developing answers to these and associated questions as Simulation Australia leads the process of establishing a framework for competency statements aligned with requirements for the Australia Qualifications Framework. It must be noted that the AQF now addresses all levels of formal education in Australia, with the result that future developments must provide for both Vocational Education Sector (VET) qualifications and tertiary education ones. ‘Competencies’ is the term usually associated with the documentation underpinning VET sector qualifications while tertiary institutions prefer to address ‘graduate attributes’ or ‘capabilities’. This paper will primarily consider documentation available in VET sector documents, while also referencing, where possible, relevant ‘graduate attributes’. The outlines the current state of the problem, as it is understood to exist in Australia, and reports on work being undertaken. It is anticipated that the conference presentation will report on progress, and outline achievements, barriers and successes, and likely next steps.

1. INTRODUCTION

Statements about ‘essential competencies’ or ‘graduate attributes’ for those working (or planning to work) in simulation–related contexts are hard to find. Australia has been successfully documenting descriptions of jobs and associated Vocational Education Sector (VET) skills for nearly 20 years. However, a major, untended gap is becoming ever more evident as the use of simulation expands in education, business and professional development contexts. The gap results from a general lack of awareness of the nature of simulation and a consequent inattention to the nature if its complex, interconnected web of capabilities, knowledge sets and applications. Things are changing rapidly and the time has come for establishing simulation as a profession in its own right.

Much as Project Management (PM) was once no more than a parcel of tools, simulation was also once simply ‘applications, tools, and playthings.’ Times have changed for both fields – although more slowly for simulation than for PM. While there may be many reasons for this, they are a topic for research at some other time. The focus here is on actions required to achieve transitions for simulation, similar to those achieved by PM - which has established itself as a profession. The concept of ‘simulation’ has remained static and simulation as a profession in its own right, is still an emergent idea – despite its long history of contributing to developments in human society.

This paper reports on i) the present state of simulation as an emergent profession, ii) exploration of available competency statements and ‘graduate attributes’ in Australia, iii) links with international activity and iv) describes activities being undertaken by Simulation Australia on behalf of Health Workforce Australia and via the Professional Development Committee. It begins with a brief review of work undertaken by the SIAA/Simulation Australia PD Committee and concludes with suggestions of an agenda for future work.

2. INNOVATIVE BEGINNINGS

Simulation Australia’s predecessor - the SIAA (Simulation industry Association of Australia) – established its Professional Development Committee whose work provided a sound basis for the present exploration of simulation as a profession. This work is being continued by the present Simulation Australia PD committee and the Divisions – including the Australian Society for Simulation in Health (ASSH) through its collaboration with Health Workforce Australia.

The SIAA PD committee set itself the task of developing a framework to assist people to engage in professional development. To this end committee members, and Shane Garrett as Training Officer, developed an Introduction to Simulation in Australia (ISA) course along with a definition of a simulation professional that is broad in scope –

SIAA defines a Simulation Professional [as] anyone who both considers themself to be involved in simulation through their employment, and who undertakes to maintain and improve their professional knowledge and skills in the field. Individuals decide to participate in the simulation community on the basis of their interests and employment aspirations.

During this period the SIAA Board also recognized that social, political and educational changes in Australia required a different organisational structure, and undertook the necessary work to become a professional – rather than an industry - body. This change in focus has seen the appointment of a full time CEO and staff,
an increase in Divisional activity, and a reunion of the flagship conference activities – SimTecT and SimHealth.

All this has emphasized the need for achieving formal recognition of existing simulation skills and development of descriptors and associated courses to formally establish simulation as a fully independent field of professional and practical activity.

3. A SHIFT IN THE STAKEHOLDERS

At the same time as this was developing other bodies were travelling a similar path. For example the Society for Simulation in Healthcare (SSH is now accrediting Simulation Centres [https://ssih.org/provisional-accreditation-for-sim-centers]) and various other professional and business entities are entering into the ‘certification’ progress for specific capabilities. However the SIAA PD committee did not see itself as the right entity to develop formal qualifications and focused on drawing together the knowledge relevant to developing and presenting the ISA and a means of establishing a Professional Certification Program for identified skill groups.

<table>
<thead>
<tr>
<th>TITLE</th>
<th>Unit Descriptor</th>
<th>Employability Skills</th>
<th>Application of the Unit</th>
<th>Competency Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEMENT</td>
<td>Elements describe essential outcomes of a unit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERFORMANCE CRITERIA</td>
<td>Required performance to show achievement Assessment to be consistent with evidence guide.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>REQUIRED KNOWLEDGE AND SKILLS</td>
<td>This describes essential knowledge and skills and level required for this unit.</td>
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<tr>
<td>Required knowledge</td>
<td></td>
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<td></td>
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<tr>
<td>Required skills</td>
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<tr>
<td>RANGE STATEMENT</td>
<td>Relates to the unit as a whole, and allows for differences that may affect performance: e.g. Potential risks may include . . . Limitations . . . Equipment may include . . . A delivery plan may include . . . Relevant training activities may include . . . Workplace procedures may include . . . Relevant stakeholders may include . . . Review may include . . . Reflect on own performance may include . . . Workplace communications may include . . .</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>EVIDENCE GUIDE</td>
<td>Advises on assessment [to be read with performance criteria] required knowledge and skills, range statement, assessment guidelines for the Package. Critical aspects for assessment and evidence required to demonstrate competency Context of / specific resources for assessment Method of assessment</td>
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Figure 1 - Framework for competency statements

This process has begun, but in some respects has been temporarily overtaken by events and changes to the wider educational environment in Australia. The initial decision was to avoid taking up a role as a provider of qualifications, but this is being superseded by the national trend towards use of outcomes oriented frameworks for all formal educational activity. Thus Simulation Australia is becoming recognized as the key body to provide the knowledge and professional input necessary for development of competencies for use by formal education bodies. In effect it will be the driver for developing the framework for professionalising the education processes intended for use with those engaging in simulation will be developed, merged, aligned and published.

The task is thus shifting from one of internal development for members’ benefits, to an external one with national orientation and implications for a much broader range of activities both within and beyond Simulation Australia. And the range of stakeholders has now extended far beyond the boundaries of the original intention of confining this work to the benefit of members of the organisation.

4. WHAT ARE COMPETENCIES?

“Competencies refer to skills or knowledge that lead to superior performance ... formed through an individual/organization’s knowledge, skills and abilities and provide a framework for distinguishing among poor [adequate and exceptional] performances.” (Carlton 2005)

Figure 1 illustrates the standard format in which competency statements are written in Australia. This is an abbreviated version and the full text is much longer. Of course there is a difference between the ‘statement’ of a competency and the actual ability of any particular individual certified as ‘competent’ - since no set of words can ever fully describe the complexity of a task in motion.

The purpose of a competency statement is to describe what is the minimum acceptable level of performance, not the maximum. And a ‘competency statement’ – in effect – provides a description of what an observer could expect to see when watching someone able to perform the specific task or task-cluster. It lists key criteria for the context of the job, how to assess for current ability and where the nominated ‘Unit’ fits within a wider employment context. As noted above, Figure 1 summarises the key textual elements of a competency statement.

5. EXISTING COMPETENCY STATEMENTS

It is not simple to establish currently available competency statements. To date four national statements of competence have been identified along with one State-based competency framework. A difficulty in establishing ‘what exists’ lies within the current terminology being used. Another lies within the widely differing understanding of what ‘simulation’ is and might be, and where and how it is/could be used. Still another constraint is created by ways in which industries and relevant national qualifications bodies have established their domains.

Two of the national competency statements were developed specifically for aviation within the Transport
industry. One is AVIM5004A Facilitate training in a synthetic environment and the other is AVIM5001A Operate a simulator both of which are located within the AVI08 Aviation Training Package. Both were commissioned by the aviation industry in line with its awareness of – and dependence on – extensive use of simulation for pilot and crew training. They are offered at the Diploma level.

A further two statements are PUAE031 Design emergency management exercises, and its companion piece PUAE030 - Manage and evaluate emergency management exercises. The descriptor of “Exercise” meant these were not found through conventional searches, but via some fortuitous networking. So it is yet to be established whether others are out there, waiting to be discovered.

The Queensland Health, Skills Development Centre established a Vocational Graduate Certificate of Healthcare Simulation – course code 30791QLD - with a full set of competency statements relevant to the use of simulation in Healthcare.

Health Workforce Australia contracted Simulation Australia to explore what is involved in establishing national accreditation for those working in simulation in health in Australia and is also sponsoring workshops introducing basic knowledge and skills through a funded national program.

6. GENERIC COMPETENCIES

All of these documents – and others that may exist but are not identified here – are unknown outside their specific domain of operation. Their existence, however much each one is ‘delimited’ by its context, suggests that the problem of developing ‘generic competency statements’ may, fortunately, have a finite number of core features.

There is quite a lot of information available – in various domains – about what might be included in competency statements for simulation professionals. However, as long as they remain domain-specific, using terms and contexts relevant only to particular settings, they will be of limited use to the discipline/profession of simulation. However their existence indicates that a key part of developing generic competencies involves agreeing a common language in regard to core elements of ‘simulation’.

Another factor in the process of developing generic competencies concerns inconsistent use of the term ‘competency’. According to the Health Information Management Association of Australia (HIMAA) -

Competency standards define the skills and knowledge to operate effectively in employment and how they need to be applied.

A unit of competency is the specification of knowledge and skill and the application of that knowledge and skill to the standard f performance expected in the workplace. A unit of competency is the smallest unit that can be assessed and recognised.

In effect we are concerned with descriptions of actions, separate from the actions themselves, but leading to agreement about what the actions will look like when performed to an agreed standard. Problems arise however, as soon as such descriptors include terms like ‘effective’ and ‘smallest’.

Fro example the National Agency for Finite Element Methods and Standards (NAEFMS - active in the UK, Western Europe and the Americas) provides a certification process for professional simulation engineers. While this process requires the accumulation of competency in workplace experience its website, as far as could be ascertained, does not provide a definition of ‘competency’ as such. It does note that its program covers twenty-six technical areas, including more than 1400 individual competency statements – for the relatively narrowly domain of simulation in computing engineering - via its PSE (Professional Simulation Engineer) Competencies. So it is likely that the ‘smallest’ units are likely to be somewhat ‘smaller’ than those identified in standard AQF documents. While NAEFMS is an international body – not operating in Australia - its work will have implications for engineering aspects of Simulation Australia’s work, not least because some of its member entities also operate here and are members. The Society for Simulation in Healthcare (SSH) has the potential for a similar impact on the health domain.

The denominator of ‘simulation’ is not yet a sufficiently differentiating factor to enable all those involved in the field to accept that it is a domain in its own right. Initial professional development permanently shapes an individual’s perceptions of a field of practice, which means that engineers, health workers, educators, aviation and defence specialists etc. may all find it challenging to ‘see beyond’ the boundaries of their own domain.

Establishing generic competencies, sufficient for both existing simulation experts and the world in general, involves identifying a set of factors which all have in common requires greater than usual refined exercise of “Ociam’s Razor”. This maxim proposes that “It is futile to do with more things that which can be done with fewer” and that ”simpler explanations are, other things being equal, generally better than more complex ones” (Wikipedia)

Working on this principle will help distill a list of core factors towards establishing an irreducible set of common principles. With such a set of principles it should become possible to establish not only simulation competencies but also a path towards demonstrating that simulation is a discipline and a profession in its own right.

7. CONSIDERATIONS IN DEVELOPING GENERIC COMPETENCY STATEMENTS

The following list of factors is arranged in no particular order or weighting, and as this work proceeds each one will prove to have its own sub-set of components and attendant questions.

• Level/s of qualification
• Location of the documentation [i. e. which ISC - Industry Skills Council - will best support the work involved?]
8. WHAT ARE ‘GRADUATE ATTRIBUTES’?

Australian universities are developing their own definition of graduate attributes including both generic descriptors and course/program specific one. The University of Tasmania, for example defines generic graduate attributes as those “we wish to see in graduates irrespective of the courses they complete” (UTAS 2013) and encourages development of specific attribute statements linked to programs of study. The five UTAS generic attributes are

- Knowledge
- Communication skills
- Problem-solving skills
- Global perspective
- Social responsibility

In many cases universities link generic attributes to requirements for membership of professional associations such as those identified by the Royal Australian Institute of Architects (RAIA) –

- imaginative and creative thinking skills
- ability to analyse and critically assess problems
- ability to see the big picture as well as giving attention to the smallest detail
- ability to communicate effectively
- understanding of history, and cultural and environmental concerns

9. COMPARING COMPETENCIES AND GRADUATE ATTRIBUTES

A significant difference between VET competency statements and Tertiary graduate attributes concerns how they are located within the structure of their respective educational programs. Competencies are written to guide specific skill acquisition and are therefore located as the initiating statements directing course design and development. In contrast graduate attributes are specifically excluded from use in developing course material but are instead to be “embedded and progressively developed within a program” (CQ University).

This distinction is highly significant for the project of developing Simulation Australia’s activities in regard to establishing the characteristics of simulation as a profession. Competencies will be vital for all those employers who are seeking staff working in technical roles whether as educators, maintainers or designers. Conversely graduate attributes are sought for staff positions requiring university level qualifications. But all of the information to be developed – and that already available – must be integrated in a logical and innovative manner if simulation is to achieve professional status. This adds to the problems ahead – while also simplifying some of the likely tasks ahead.

One ‘problem’ will involve developing statements acceptable to both VET and tertiary education contexts. While the current situation is clearly based on a division of approaches this is not the only possible way to develop the necessary documentation. Another problem will concern how to demonstrate the highly integrated nature of simulation activity while meeting externally imposed requirements for assigning specific roles and tasks to one or the other level of study and employment.

However the simplifying factor emerges from recognition that the kind of work undertaken by simulation professionals provides an opportunity for reconsidering how to express essential competencies and demonstrate that simulation is not ‘profession specific’.

Developing a way to illustrate this has not been easy, and what follows is intended to be a provocative tool for creating discussion and developing the means for achieving shared understanding and eventual agreement on a coherent image to inform future activity.

A ‘GARLIC BULB AND CLOVE’ MODEL FOR IDENTIFYING COMPETENCIES AND GRADUATE ATTRIBUTES

Choosing a metaphor to illustrate a new concept is usually fraught with difficulty. The ‘onion’ metaphor is a familiar way of arranging factors in concentric circles to illustrate a relationship pattern. The suggestion that this could be applied to the problem of developing a set of generic competencies for simulation experts led to a lively discussion at the 2013 ISAGA conference in Stockholm, which in turn evolved the concept of a ‘garlic bulb and clove’ metaphor. In contrast to the onion, garlic grows a central stem around which cluster a number of ‘clove’ – the whole being called the ‘bulb’.

While the central stem is usually inedible, the bulb does not exist without it. It provides the ‘identity’ of the whole and is the link between the cloves and the roots of the plant. As ‘separate’ elements, using the stem and roots for support and nourishment, cloves
grow via concentric circles, all the while becoming ever more clearly independent entities as the plant as a whole enlarges. When separated from the bulb for use the clove does not lose its particular characteristics, instead separation tends to intensify the impact of its unique qualities. Similarly, use of simulation brings to myriad situations unique features ensuring that outcomes of its application will be different from those situations where it is not used.

Figure 2 A ‘garlic bulb and clove model for defining simulation competencies

This metaphor seems to offer a better hope of establishing a way to find common ground among all the disciplines/professions using simulation in some form in their practice. At the very least it provides a beginning point from which to explore how to cluster ‘core’ and ‘specialist’ knowledge-sets, and allows for dialogue in new ways about how the ways in which simulation is linked through the “core and roots” of shared knowledge, with specialist applications clustered as “clove” around it. Figure 2 includes two botanical images of garlic showing the stem and clustered cloves forming the whole bulb, while the third image indicates how simulations ‘core’ competencies are surrounded by specialist sets of discipline specific knowledge.

9. CORE SIMULATION COMPETENCIES/GENERIC ATTRIBUTES

The following list is compiled from discussions at the recent ISAGA conference, dialogue with members of Simulation Australia and various academic and professional experts. It is not intended to be definitive or complete, but is – rather – a kind of ‘agent provocateur’ to generate discussion and guide exploration. The list is certainly not in any order of importance or priority. Nor does it use correct terminology at all times. It is simply the beginning of something big that will need all our collaborative efforts to develop into a comprehensive and readily acceptable record of core competencies shared by all who work in simulation. Over time the dialogues will have the goal of becoming a statement about what simulation professionals all have in common. All comments are welcome.

- Systems thinking
- Managing for uncertainty
- Creating play/playfulness
- Manage activity within – and outcomes of - simulation events
- Working in complex domains of knowledge
- Ability to relate observations to analysis
- Appreciate a ‘reality/simulation’ continuum
- Curiosity
- Acuity
- Understand core body of simulation knowledge

10. CONTEXTUALISING THIS PROJECT

Items to be added, amended and deleted - and how we do that - will be partial determinants of the success of this project. Members of disciplines currently regarded as widely separated are often resistant to the suggestion that they share core elements of capability and knowledge. Frequently their reactions include - withdrawal into silos of known and familiar content, taking action to avoid ‘contamination’ of disciplinary purity and denial of the possible validity of the connections being proposed. I say this without rancor – and with knowledge and experience of such responses to past attempts at achieving cross-disciplinary collaboration. So at least one additional item must be added to the above list of competencies/generic attributes is this one -

- Ability to work in cross-disciplinary contexts

This challenges the centuries old tendency towards separation and isolation of professional bodies of knowledge, which is a negative consequence of the “Age of Enlightenment” erection of ‘scientific’ barriers between previously undifferentiated arenas of study. This effect has led to ever increasing chasms opening up between fields of study. Such chasms also generate a ‘hierarchy’ of a kind, within which some areas of study acquire status while others lose it. One summary of the differences among astronomy, astrophysics and astrology notes that

While astrology has no scientific basis, it did have a foundational role in the development of astronomy and various historical events, as it was astrologists that first began peering into the heavens centuries ago. (About.com)

Thus – over time – a new field of study was created, one was reduced to a narrower focus, and the third ‘relegated’ to the status of ‘pseudoscience’. This status- oriented drive influencing the development of scientific fields of study creates interesting ‘silo’ effects and blind spots that take some effort to identify and challenge. In his seminal work on the nature of
‘paradigm shifts’ Kuhn (1970) pointed out that advocates of diverse scientific paradigms will not easily be able to make contact with different point of view because they are, in effect, living in different worlds. He demonstrated how concepts and ideas become so strongly embedded within a context that those committed to a particular perspective become unable to acknowledge that overarching parallels and linkages might be evident to others. At times this may not be a matter of great moment, however in regard to simulation as a field of work, the existence of such perspectives has been an almost insurmountable barrier.

11. IMPLICATIONS FOR SIMULATION AS A DISCIPLINE

The past 12 years or so has seen some progress in relation to crossing the boundaries among the various branches and applications of simulation. The combining of the SimTecT and SimHealth conferences in 2013 is one signal that some barriers are coming down, as is the theme for the conference – with its evident focus on drawing attention to the multivariate ways in which simulation occupies a place in so many disciplines, research contexts and workplaces.

For many of us who work as simulation specialists the ‘silo’ effect led to attachment to a specific ‘discipline’ often in ignorance of similar – even identical – work being done in arenas outside the domain of our specialist knowledge. I am no exception. When I began using ‘simulations and games for learning’ I thought the term applied only to recently developed interactive forms of learning for management and leadership education. Time, exploration and a deepening curiosity about the nature of simulation, play, games, role play and case study led me further and further away from that initial association and into my present position where simulation [and associated terms] are evidently components of a field of study that has its own unique characteristics.

12. CONCLUSIONS

The existence of formally accepted competency statements and graduate attributes – as described earlier – are simultaneously indicators of the adverse impact of such ‘specialisations’ of knowledge and opportunities for adopting a unifying strategy as this work develops. For example the aviation documents it were prepared by authors who had a driving concern them with a concern to make them as generic as possible, and therefore available for adaptation by later users. As the challenges posed by this project are explored further and become more widely known their generosity will prove to be an indicator of the possibilities for cooperation and the benefits of widening awareness and understanding of simulations’ contributions to learning, capability improvement and research. In fact all the existing documentation has the capacity to be adapted for wider application, alongside the development of additional documents.

REFERENCES


Garlic images [http://www.painters-online.co.uk/Features/Line-and-Tonal-Pencil-Drawing-for-Botanical-Observations/_ft343 and](http://www.painters-online.co.uk/Features/Line-and-Tonal-Pencil-Drawing-for-Botanical-Observations/_ft343)

