

Adjudication Matrix to Accompany GRCSE v. 1.0

Comment #	Reviewer #	Category	Comment by Reviewer	Adjudication Action	Author Remarks
001	001	Entrance Expectations	There was no discussion of the existing SE Functional areas (Sarah Sheard paper from INCOSE Symposium) related to forms of desired SE experience for a grad student candidate coming from industry.	Accepted	near copy of #15
002	001	Outcomes	In the discussion of OUTCOMES in Section 3.2, given the intent of academia, industry, and INCOSE that Systems Engineers becomes leaders it seems that the topic of TEAMWORK ought to include more about LEADERSHIP.	Accepted	modified outcome 7 to include leadership capabilities
003	001	Implementation	I teach an SE course at three universities in our local area and I think that these are usable.	Noted	
004	001	Implementation	Yes. They are almost "too general" and might actually benefit from some "applicable examples" to give universities a better idea of applying the guidelines. However, the tables in chapter 5 are quite useful.	Noted	
005	001	Architecture	The tables in Chapter 5 can be used to align SE competency models and outcomes desired for grades of SE levels.	Noted	
006	001	Implementation	Quite useful. It's making a good start at aligning objectives, outcomes, competency or functional skills, and an approach to domain expertise and identifying viable concentration areas within the SE domain.	Noted	
007	001	Implementation	useful because it's general enough to be internationally applicable.	Noted	
008	001	Introduction	p. 4, Section 1.4, bullet list, second bullet: (CHANGE TO READ) "These discipline-centric foundational concepts are integrated into the GRCSE..."	Accepted	Changed as suggested.
009	001	Introduction	yes. I think the linkage to the SEBok and the CorBok are very useful, as well as the rationale of using the Software reference curriculum as a guide. I do have a question: on page 7, the outline of the 9 chapters seems to imply a reverse chronological order discussion of outcomes (they appear to be discussed as (1) 3-5 yrs after graduation, (2) immediately after graduation, and (3) background possessed by applying students to the grad program. Would it not be more readable to discuss them in their true chronological order?	Noted	The reviewer's point is valid, but we ordered GRCSE chapters to place the goal of the work first and then to work backwards through the steps required to achieve it.
010	001	Objectives	Generic objectives discussion is useful. Would the writers consider adding Sara Sheard's "12 functional areas" as a reference for use in the discussion on page 13 for graduates that are 3-5 years into their careers as systems engineers?	Accepted	language added.
011	001	Objectives	Page 14, at the end of the paragraph, considering (ADD) "Academic institutions and employers might consider intentional collaboration in both near-term cross sectional studies, and longer-term longitudinal studies to investigate the effectiveness and usefulness of the SE education outcomes. These studies could be done in cooperation with CSER or the university's engineering education and systems engineering faculty stakeholders for useful graduate research topics."	Accepted	language added.
012	001	Outcomes	The outcomes do a very good job. In section 3.2, page 18, under the list of outcomes, for #7 it could be useful to add "Leadership" to the title of "Teamwork". Possibly add the following at the end of the paragraph, "A longer term expectation is that graduate systems engineers will grow into leadership roles: small teams, functional leadership, and later into senior leadership roles in both technical and managerial positions."	Noted	
013	001	Outcomes/University Implementation	No program yet formulated. I do teach an Intro to SE at three universities locally.	Noted	
014	001	Outcomes/Industry Implementation	I work for industry and the objectives align very well with what we desire in new hires.	Noted	
015	001	Entrance Expectations	The 3 universities do not yet have an SE program, but the background expectations align pretty well. In Section 4.2, page 26, List Item #2, Practical Experience: suggest ADDING the following, "insert the brief discussion of the SE Functional Areas used by the INCOSE Certification Program, from the public website under CERTIFICATION/Which Level is right for me?" <a href="http://www.incose.org/educationcareers/certification/details.aspx?id=level">http://www.incose.org/educationcareers/certification/details.aspx?id=level</a>	Accepted	near copy of #1
016	001	Entrance Expectations	I think that it is the minimal amount and that is the BARE MINIMUM. Knowledge of the terminology, life cycle, and some of the processes inherent in applying SE in any domain are necessary to enable the student to quickly and effectively absorb all the "other information" that is going to come at them in the curriculum.	Noted	
017	001	Architecture	yes, it's very flexible.	Noted	
018	001	Architecture	I think that 50% strikes an effective balance between the CorBok and course information.	Noted	
019	001	Architecture	yes, although another concentration might be worth exploring in ARCHITECTURE.	Deferred	Another concentration will be added as part of work following the release of GRCSE 1.0

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020	001	CorBoK: Top 10 for "App"	Systems Context and Developing CONOPS, System Modeling Concepts, Systems Analysis Approach, System Definition, Mission Analysis and Requirements, System Integration, System Verification and Validation, System Deployment, Trade offs, and Service Life Extension.	Noted	
021	001	CorBoK: SEM	Risk Management, Planning, Configuration (Change) Management.	Noted	CorBoK - Top 3 - SEM
022	001	CorBoK: SDD	Architectural Design, Integration of Product and Process, and Logistics (incorporation of specialty engineering into the system's requirements & design). These three areas are involved in the initial system concept development, tailoring of processes, estimating of effort and cost, and story boarding for proposal development as well as taking a proposed system and turning it into reality.	Noted	CorBoK - Top 3 - SDD
023	001	Implementation	very useful. no improvements.	Noted	
024	001	Assessment	very useful. no changes.	Noted	
025	001	Appendix B	I think it does a very good job.	Noted	
026	001	Appendix C	very clear.	Noted	
027	001	Appendix D	I think the mapping is quite helpful.	Noted	
028	001	Appendix E	good as is.	Noted	
029	001	Appendix E	It's aligned with other competency frameworks I have used, been assessed by, or discussed in my work with the INCOSE Certification program.	Noted	
030	002	Introduction	This list looks good to me.	Noted	
031	002	Entrance Expectations	Each discipline will require at least a minimum set of competencies, but these can be addressed as prerequisites or in the last 50% of the course.	Noted	
032	002	Architecture	I think the nature of the design project must be spelled out in such a way that it can be used by each discipline. I think it is necessary to have a project that is a real problem faced by a real organization, with a contact and sponsor from that organization.	Declined	Obtaining a "real problem" is certainly desirable, but not always feasible. With the students from different organizations, proprietary rights issues often arise.
033	002	Objectives	most problems are more than one-dimensional, and the proposed curriculum addresses many of the very important but non-traditional dimensions such as personnel, computer software, and the basic ambiguities of that need to be addressed when accomplishing real objectives.	Noted	
034	002	Implementation	I'm a retired professor, and the main value to me would be in understanding the specific needs of people and organizations who come to me with concerns and problems.	Noted	
035	002	Implementation	I think it looks like a very good idea. But it will overlap with many industrial engineering MS programs.	Noted	
036	002	Introduction	this is an attempt to define system engineering as a discipline and to point out important systems engineering subjects that could be included with value in other MS programs	Noted	
037	002	Introduction	I think this is done well.	Noted	
038	002	Introduction	I agree with the purposes of GRCSE as stated in Chapter 1.	Noted	
039	002	Objectives	The objectives shown would be attractive for most aspiring systems managers, i.e., many people aspiring to management.	Noted	
040	002	Entrance Expectations Outcomes	Background education for a career in systems engineering. I think this depends on the application project chosen. If it is a real problem, the degrees individual will be welcome in many areas; if not, the degree will be of much less value.	Noted	
041	002	Outcomes	I think these are greater than needs for SE grads in academia.	Noted	
042	002	Entrance Expectation	15 and 16. Backgrounds in SE programs vs ours? Ours is an IE program and accepts people with different backgrounds, so long as the math and communications requirements are met. I don't see much difference in specific entrance between the two.	Noted	
043	002	Entrance Expectation	Two years experience ... My experience with officers at the Naval Postgraduate School, most of whom had had significant sea duty, showed a great difference in maturity over students at the University of Utah who had come directly from schools.	Noted	
044	002	Architecture /SEM & SDD	This was not discussed in the material I received.	Noted	Concentrations are discussed in Chapter 5. We have added additional discussion in Chapter 6.
045	002	General	I taught math for three years as a Navy officer at the Naval Postgraduate School, then got a Ph.D. in engineering from Virginia Tech, taught engineering for 13 years at the University of Utah and 18 at Clemson, then retired. I'm a fellow in the IIE and a licensed professional engineer in South Carolina, Georgia, and Hawaii. If I can be of help in SE, please feel free to call on me.	Noted	
046	003	Introduction	Yes, I think so	Noted	
047	003	Introduction	I believe that GRCSE v0.5 has reached a level of maturity where it is of significant utility to the SE community and I applaud the efforts of the GRCSE team in brining it to this point.	Noted	

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048	003	Introduction	I think that the aims of GRCSE match real needs within the SE community.	Noted	
049	003	Introduction	I find the structure, intended method of application and relationship with SEBoK significantly clearer than was the case for v0.25 and consistent with the aims.	Noted	
050	003	Evolution	I note that there are plans for further evolution and I hope that GRCSE will be released shortly so that the SE community can start to benefit from GRCSE and GRCSE can benefit from feedback from practical application.	Noted	
051	003	Architecture	potential for improvement regarding the treatment of the knowledge and skills needed to perform SE on systems that have entered service. These seem to me to fall broadly into two categories: 1 [of 2]. New knowledge and skills that are needed for the first time during this phase of the lifecycle. Just by way of illustration, these might include an understanding of the difference between reactive, adaptive and perfective maintenance; different strategies for replacing parts; and some of the economic models that are used to take asset management strategies. From a curriculum design point of view, this knowledge and these skills are no different from the knowledge and skills in any other area.	Noted	
052	003	Architecture	potential for improvement regarding the treatment of the knowledge and skills needed to perform SE on systems that have entered service. These seem to me to fall broadly into two categories: 2 [of 2]. Adaptation of the knowledge and skills needed to perform SE during earlier phases of the lifecycle. This is needed because systems that have entered service need to be changed and, when they are changed, the requirements, design, V&V procedures and so on need to be revisited. So, for example when making a relative small change to a system which does not quite fit within the existing architecture one has to choose between going to the expense and disruption of changing the architecture or 'patching' the change onto the existing architecture. Established practice is generally to perform a number of patches and then, before the consistency and coherence of the architecture is degraded to an unacceptable degree, to perform some sort of mid-life upgrade. To maintain the architecture of a system which has entered service, one requires, in my experience both the knowledge and skills that were required to create it in the first place and additional knowledge and skills such as those required to judge when a mid-life upgrade is required.	Noted	
054	003	Architecture	So the generic knowledge and skills required to perform in-service SE build upon the generic knowledge and skills to perform SE on systems being realized in the first instance in rather the same way that the knowledge and skills required to perform SE in the aerospace domain build upon generic SE knowledge and skills. This dependency is not often clearly articulated in reference sources on SE which prefer the more comfortable fiction that the in-service phase is just the next phase after transition and validation. It is not clearly articulated yet, in my opinion, in the SEBoK but that may change. Acknowledging it clearly in GRCSE would, in my view, have the potential to lead to the following benefits: 1. In the short-term it may help to prevent those drawing up graduate SE programs to avoid making unrealistic claims about the degree to which the programs will prepare graduates for performing in-service SE 2. In the longer-term, it should assist institutions drawing up graduate SE programs to prepare graduates better for performing in-service SE 3. It may also assist these institutions to consider alternatives to treating in-service topics in a separate module such as including in-service aspect considerations in the module for requirements, architecture and so on I have taken, when speaking at SE conferences on the topic of in-service SE to asking the audience what proportion of them is involved in SE on systems that have entered service. The figure is reliably over 50% so, while this topic may seem at first sight to be rather detailed, I believe that it is of real significance.	Noted	
055	003	Architecture	Yes. One way of exploiting the potential for improvement identified in my response to question 19 would be to add 'Systems Sustainment' (that is, the performance of SE on systems that have entered service) as a new concentration.	Noted	
056	003	Architecture	I acknowledge that the underlying body of knowledge may not currently be mature enough to support graduate programs with this concentration on 2012, although I believe that the economics associated with the need to sustain an ever-increasing population of complex systems is likely to drive rapid development in this area.	Noted	
057	003	Architecture	If the GRCSE team decides against adding this concentration in the initial issue, would it be worth identifying it as a possible future addition?	Deferred	No additional concentrations will be added in GRCSE 1.0, and there are multiple candidates for future consideration. System sustainment may be a future candidate.
058	003	General	I am grateful for the opportunity to review GRCSE v0.5.	Noted	
059	003	General	As I am not a professional educator, I find myself limited in the areas where I feel that I can usefully contribute. I have a particular interest in the practice of SE on systems that have entered service and my most significant comment concerns the treatment of that part of SE in GRCSE.	Noted	

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060	004	Glossary	These thoughts may not be original, but I want to share them with you anyway. In the SEBoK Part 2 teleconferences we have had many discussions and disagreements about complexity, a word I see in the GRCSE plan several times. The point is that there are two views of complexity.	Modified	Definition of complexity needs to be added to ensure that it is clear how this is being used in the document
061	004	Glossary	The difficulty is that many of the authors only believe in one of these views. Rick Adcock has attempted to write a complexity article that covers both views.	Noted	See response to comment #60.
062	004	Glossary	One view is the human perception view. This is sometimes called the behavioural complexity view. The idea is that some systems are just hard to understand. Many writers use this word without specifying what they mean.	Noted	See response to comment #60.
063	004	Glossary	In the GRCSE document phrases like "complex programs" appear. I think the behavioural view is generally implied.	Noted	See response to comment #60.
064	004	Glossary	The other view is called structural complexity. This view has to do with the properties of the system itself and has nothing to do with the human perception. Many books have been written on this topic without ever mentioning the human perception aspect.	Noted	See response to comment #60.
065	004	Glossary	There are many properties of a structurally complex system but the main one is that the elements of the system are self-organising. Nature abounds with such systems: flocks of geese, colonies of ants, etc. There are human-made structurally complex systems: a squadron of aircraft, for example. Human-intensive systems are almost always structurally complex. Having made that distinction, I now want to talk about an SE curriculum.	Noted	See response to comment #60.
066	004	Architecture	Traditional SE textbooks have an implied assumption that the system is a non-complex products, such as an aircraft or a space vehicle. Blanchard and Fabrycky is an example.	Declined	I don't consider a space vehicle or aircraft as a "non-complex product."
067	004	Architecture	Although the word complex appears in this book, it is never defined. When this happens, I believe that the behavioural view is implied. Such concepts as Complex Adaptive Systems are never mentioned.	Noted	
068	004	Architecture	My suggestion is that any curriculum that wants to reflect "basic" SE vs. "advanced" SE should use structural complexity as the criterion for distinguishing between the two.	Declined	A wide variety of systems reflect state behavior and the main complexity factor may be how the system behaves as a function of time
069	004	Architecture	That Course #1 will be "basic" and will discuss only non-complex systems as they always have.	Declined	
070	004	Architecture	Course #2 will be "advanced" SE and will discuss Complex Adaptive Systems and Complex Systems as a whole. There may be other criteria, but this one seems to me to be the main one.	Declined	
071	004	Architecture	As I said above, there are some within our community (and within your country) who believe that behavioural complexity is the ONLY complexity. This notion is refuted by the literature. I believe that both are valid views.	Noted	
072	004	Architecture	In addition I would suggest that structural complexity is the important one for systems engineers.	Declined	Depending on the system characteristics, either type of complexity may be found.
073	004	Architecture	Behavioural complexity is more appropriately associated with organisational psychology, which has a place in SE but not at the head of the table.	Declined	
074	005	General/Academic View	Yes, as a guide for including SE in the engineering curriculum.	Noted	
075	005	General/Personal Utility	It alerted me to gaps in our graduate program in Operations Research, relative to several aspects that are well spelled out in the SE document but are lacking in our program	Noted	
076	005	General/SE Comm Utility	It should help establish the field, though I am not sure as separate from the usual domains in engineering.	Noted	
077	005	Architecture	Very well written. However, I wonder if the curriculum should be labeled "Systems Science & Engineering" (SSE) since there is a great deal of "science" in its core topics. Our school had to change "Materials Engineering" to "Materials Science & Engineering" because of the heavy "science" content of the program. Further, there are many institutions with programs in operations research (OR) which is closely identified with 'systems analysis'. I wonder if this fact has been taken into account in the writing of this document.	Noted	
078	005	Introduction	Yes. There is a definite need for technically competent engineers who see the "whole" and contribute to its success.	Noted	
079	005	Glossary	In the definition of "systems engineering" there is no definition of what a "system" is (the definition on p.69 should be highlighted here), and what differentiates "systems engineering" from other 'systems' activities, such as "systems analysis".	Modified	Both the definition of "system" and "systems engineering" are included in the glossary; definitions align with SEBoK v. 1.0
080	005	CorBoK	My question is encapsulated in the sentences (p.33): "SE deals with the interfaces between components, and between the system and its environment. This requires grasping the big picture and integrating interdisciplinary knowledge from a top-down perspective, even while acquiring in-depth knowledge."	Noted	
081	005	Outcomes	They do. However, one must bear in mind that many graduates, even at the master's level, do not find jobs in their areas of expertise. This may distort their value as systems engineers, and also distort any subsequent evaluation of their impact.	Noted	
082	005	Entrance Expectations	It is appropriate, though very hard to implement. It requires cooperation from establishments outside the university which may be difficult to realize and maintain.	Noted	

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083	005	Entrance Expectations	Our own Industrial Extension Service, which was established with the dual purpose of helping industry as well as provide training for our engineering u.g. and grad. students has turned into a money-making enterprise with little regard to the training of students. Unfortunate, but true.	Noted	
084	005	Architecture	It is sufficiently flexible.	Noted	
085	005	Architecture /CorBoK	It may be a bit tight because I believe that some additional topics should also be covered in coursework. I would advocate increasing it closer to 75% of the curriculum, leaving the remaining 25% to implementation of SE in the individual domains.	Declined	We believe the 50% is appropriate: to cover the CorBoK at the recommended Bloom's levels and to allow flexibility for other topics.
086	005	Architecture /SEM & SDD	They are excellent starters.	Noted	
087	005	CorBoK/SDD	I was surprised to note the absence of two important concepts in the proposed core subjects: simulation and optimization. There is a great deal of overlap between SE and OR which is not referred to at all in the document.	Noted	The CorBoK (and SEBoK) includes topics on Simulation and OR: Simulation is discussed extensively across numerous SEBoK KAs (especially in the discussion of models, systems analysis, V&V) , and Part 6 contains a KA on Systems Engineering and Industrial Engineering, which includes OR material. The CorBoK tables only provide a high level view of SE; to see the details of cross-cutting issues such as "simulation", the SEBoK must be consulted.
088	005	Implementation	A great deal depends on the instructors.	Noted	
089		Implementation	The professors of the core courses should themselves be highly qualified individuals who had experience in the real world so that the classroom examples relate to the concept of SE, rather than be abstract constructs that bear little resemblance to reality.	Noted	
090	005	Outcomes	I am in full agreement with the statement that "the ability to demonstrate synthesis level ability in an aspect of SE is an important outcome in its own right, and will remain valid even if the student does not go on to practice in that aspect" (p.17, top), it would be helpful to indicate how such demonstration of ability is achieved?	Accepted	Added words indicating ways that this can be achieved
091	005	Tutorials	The answer is yes, and I would suggest that you contact professor XXXX	Noted	
092	005	Assessment	Very useful. Our Grad. Sch. mandates such assessment for every graduate program at 5 yrs intervals.	Noted	
093	005	Assessment	Assessment of program objectives (p.53) can reduce "respondent burnout" by diversifying the respondents: if graduates work in pharmaceutical companies, then one or two companies are selected on a rotational basis so that any one company is not requested to provide feedback except once in 10 years, say. The document should highlight the difficulty in "assessment of program outcomes" (§8.3) due to graduates not working in their expertise (e.g., a systems engineer employed as sales representative).	Accepted	A sentence has been added in chapter 8 concerning companies selection problem
094	005	Evolution	Agree.	Noted	
095	005	Appendix B	Many departments in the college of engineering do not highlight the education in systems, although many of their graduates end up being "systems engineers" or managers thereof. Sometimes it seems to me that we need to educate the educators?	Noted	
096	005	General/Editorial	There are a few 'editorial' comments which I would like to present at this time. The correction is underlined. p.1, bottom: "As SE continues to mature, curricula that foster these KSAs are becoming critically important."	Noted	We are performing another final edit of the whole prior to shipping.
097	005	General/Editorial	p.34, eliminate the words "This part" at the start of each part; they are redundant.	Noted	
098	005	General/Editorial	p.45, "Understanding how the external stakeholders needs have been elicited and compiled is an important part of self-analysis."	Noted	
099	005	General/Editorial References	p.70, top: "This simple idea is then further elaborated through ... " Fabrycky, W. J. 2010. Systems engineering: Its emerging academic and professional attributes... p.85: "reserving time for domain specific content."	Noted	
100	006	Appendix C	The use of Bloom's Taxonomy is relevant. Within the appendix describing Bloom's taxonomy, it might be worthwhile to give an example of a university who uses these classifications for learning objectives.	Declined	To give an example would go against the general policy of not naming institutions because of the the possibility that such naming may result in some readers inferring a value judgement about the institution named.
101	006	Implementation	The Sustainability Consortium is in dire need of an educational outreach program and the work we do is based on a systems approach. This type of guide would be very helpful in developing an education program. Even if the program is not specifically for SE, it still provides guidance.	Noted	
102	006	General/Academic View	Yes, each section throughout the GRCSE mentions that the individual institution can specify specific criteria, etc.	Noted	
103	006	General/Industry View	I don't work for industry, but I do work with industry. I foresee this guide helping industry and government by helping them develop their position descriptions related to SE.	Noted	
104	006	General/Personal Utility	It is very useful in helping to understand how to develop guidelines for an interdisciplinary program.	Noted	
105	006	Introduction	Good	Noted	

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106	006	Introduction Glossary	Yes, but it needs a definition of SE. You have SE defined in the glossary, but it needs to also be in the Introduction.	Accepted	
107	006	Introduction	Yes, but I would add that this helps to harmonize communication across SE programs around the world, thus allowing for transferability of credits and exchanges between personnel in a global market.	Noted	
108	006	Outcomes	The only thing that I think this could do a better job of is clearly differentiating SE from the other types of engineering fields (applied science fields). You mention the other fields, but you don't go on to specifically say how SE is different. It is interdisciplinary and why is that good? Why does this field have value other than the other fields of engineering?	Noted	This is done through the earlier chapters of the GRCSE (Chapter 1) and also throughout the SEBOK document
109	006	Entrance Expectations	I think this is going to be very hard to define and defend for a prospective applicant. Do they need a job title of some sort, such as "Systems Engineer for Kellogg"? Systems are everywhere, so what exactly would be needed in those two years of experience?	Declined	the document does describes this in general and the section is not implying a distinctive title
110	006	Entrance Expectations	There should be a complex story that they have to read and the recount back how all of the parts fit together and why.	Declined	this requirement goes substantially further than the team recommends but could be implemented as desired
111	006	Implementation	On page 47, reference Figure 7 earlier in that chapter.	Noted	
112	006	Architecture/CorBoK	I would be careful that the student has an opportunity to be well-rounded across multiple disciplines. There are few clear boundaries on systems, so having broad knowledge of different fields of study is highly valuable for someone in a field such as SE.	Accepted	We have added wording emphasizing the importance of this issue.
113	006	CorBoK: Top 10 for "App"	Natural science foundations, statistics, geometry, computing fundamentals, written communication, ethics and professional conduct. Engineering and oral communication can be learned by doing them later on the job.	Noted	
114	006	Appendix C	Very good.	Noted	
115	006	Appendix G	List them, as you have, but also create a map that links them to Bloom's Taxonomy and outcomes of the graduate program.	Declined	There is no need to present Use case relationship with Bloom taxonomy and/or outcomes
116	006	Appendix G	This can be used to harmonize curricula and therefore further ensure transferability of credits for students.	Noted	
117	006	General/Editorial	Page 8, The sample objectives on page 8 needs the line, "Program will..."	Accepted	
118	006	General/Editorial	Page 20, Write out IEEE.	Accepted	
119	006	General/Editorial	Page 20, The reference for Fabrychy needs the date (2010).	Accepted	
120	006	General/Editorial	Page 23, It seems that some of the circles need arrows, or at least a clear indication of their connections.	Noted	
121	006	General/Editorial	Page 29, I recommend the use of bullets in the sections on this page, as well as throughout the document. Bullet points with key points will increase the use of the guide.	Noted	
122	006	General/Editorial	Page 29, Write out ABET.	Noted	
123	006	General/Editorial	Page 35, The applications are listed, and this might limit the perceived use of it.	Noted	
124	006	General/Editorial	Page 38, add a definition of SE and how it differs from other engineering fields.	Noted	SE is defined in the glossary. The definition provides sufficient discrimination from other fields of engineering.
125	006	General/Editorial	Page 39, clarify who would use and fill out Table 2.	Noted	Both table 2 and the table on page 39 are written in an information conveying form. Wedo not understand what is being requested here.
126	007	General	I was asked, as a member of the INCOSE In-Service Systems Working Group (ISSWG), to provide a review of GRCSE from the perspective of In Service Systems Engineering. I am aware you have received some comments from an ISSWG colleague, REVIEWER #003, already.	Noted	
127	007	CorBoK	I will concur with #003 general comment that explicit discussion of the topic of In-Service SE appears to be lacking from GRCSE at present.	Declined	We feel this is explicitly covered under " System Deployment and Use" and "Product and Service Life Management" in Table 5 . Of course, elements of SE theory and practice related to this area are covered in other KAs.
128	007	CorBoK/Architecture	I'll also concur that the present Body of Knowledge in this area is not terribly mature, although we are working to change that. Therefore I cannot suggest any specific changes to GRCSE at this time.	Noted	
129	007	CorBoK	I will offer the following thoughts: It seems the tables in Chapter 6 come closest to addressing the In-Service topic, so perhaps in the future that would be an opportune place to insert additional content. [Table 5, "System Deployment and Use" and "Product and Service Life Management" are most relevant.]	Noted	

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130	007	CorBoK	However, unless GRCSE delves into syllabus level content for these topic areas, it may not be appropriate to add content to GRCSE, but rather ensure the referenced SEBoK parts include the relevant content. As an example, under the topic of "Capability Updates, Upgrades and Modernization" (table 5 column 2) we would want to ensure that students were learning about the many things that drive the need for these changes, how to best manage these new requirements, what new (when compared to original development) factors need to be considered when changing a fielded system, and best practices for implementing the change, depending on the nature of the system and the environment in which it is presently fielded.	Noted	GRCSE will not recommend specific courses or their content.
131	007	General	I'm not sure that level of detail is desired for GRCSE. If it is, I am certain our WG would be happy to keep in contact with your authors.	Noted	
132	007	General	I apologize that my workload prevented me from accomplishing a more general review of GRCSE. I did provide comments on version 0.25 and would be willing to continue to provide review and comment to future versions as my workload allows. The document appears to be quite improved from version 0.25, so I applaud your continuing efforts.	Noted	
133	008	Introduction	good general overview of purpose and goals	Noted	
134	008	Introduction	acceptable, this is a difficult domain to characterize from an academic perspective. The 'experience' factor is very large and critical toward the development of SE	Noted	
135	008	Objectives	yes they are appropriate	Noted	
136	008	Outcomes Objectives	good general overview and setting of expectations. The objectives are appropriately chosen. The acknowledgement that academia can only prepare and position the graduate is appropriate.	Noted	
137	008	Outcomes	they align and provide a decent foundation. Experience is critical and this will only be gained through real world involvement in product development	Noted	
138	008	Entrance Expectations	Dependent upon the educational level of the candidate and the target domain, 2 years may be reasonable in some situations and not enough in others	Noted	
139	008	Architecture	it appears to be adequately flexible	Noted	
140	008	Architecture /CorBoK	The inherent definition of an SE is some with broad knowledge and the ability or experience to do a 'deep-dive' into a specific area of expertise. I think 50% is good but would not increase it.	Noted	
141	008	Architecture /SEM & SDD	These are a generally good breakdown. More resolution could be applied but at the risk of restricting the flexibility of various programs.	Noted	
142	008	Assessment	In general the process makes sense. Evaluation of a programs effectiveness is a difficult challenge when it comes to collecting good data.	Noted	
143	008	Assessment	I think the most valuable and consistent form of data that could be used to evaluate the program is 2 fold: 1) Input and participation on the part of potential employers and 2) evaluation of students during and at the completion of the program. Once the student is gone from the program the ability to collect data will diminish.	Noted	
144	008	Evolution	I agree with the proposed evolution. This assumes that IEEE and INCOSE are 100% committed to supporting the maintenance, deployment, and use of the guidance documents.	Noted	
145	008	Appendix B	well supported	Noted	
146	008	Appendix C	acceptable for this analysis	Noted	
147	008	General	I found it interesting that the primary contributors fell into 3 main categories; academia, defense, and aerospace/transportation.	Noted	
148	008	General	I think the commercial sector not only has a significant need for well defined and applied SE but also has a unique perspective to add to the overall definition.	Noted	
149	008	General	My suggestion would be to seek out input and participation from these business sectors.	Noted	
150	008	General	Personally I am deeply involved in biomedical and clinical diagnostic systems. Well defined and implemented SE programs and disciplines are in short supply in this sector from my experience.	Noted	We hope that GRCSE helps on the quality of thought about programs in all sectors, including Biomedical.
151	009	General	overall I found this document thorough, well structured, easy to apply, and valuable for programs in various states of development	Noted	
152	009	General	Yes. The design, requirements, and content seem for the most part to align well with engineering program designs and would provide more common structure across these programs.	Noted	
153	009	Assessment	This provides us a good document to evaluate university partners. This also helps define	Noted	
154	009	General/Personal Utility	This would help me evaluate programs. I would use this myself.those competencies we would look to universities to develop and those we would develop on our own. I could see myself reusing the list of competencies for other purposes as well.	Noted	
155	009	Introduction	Simple to understand and provides a good overview.	Noted	
156	009	Introduction	I had heard about the intent so was more interested in the remaining chapters.	Noted	
157	009	Executive Summary	Page ix. item 9. Consider replacing term "compromises" with "tradeoffs"	Accepted	The executive summary has been completely rewritten, and this is no longer relevant here.

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158	009	Executive Summary	Page x. Wonder if you should expand our thinking on entry degrees to include economics. They may require some additional prerequisites as defined later in this document, but more and more we see the application of SE within that domain.	Noted	Executive summary completely rewritten to work at the proper level and length. (v0.5 was far too long)
159	009	Objectives	One limitation among today's engineering graduates often cited to me by management is not their inability to apply new techniques and processes as defined in this document's objectives, but rather their understanding of the meaning and implications of their findings from these techniques.	Noted	
160	009	Outcomes	It is not good enough for engineers to be able to run calculations well, but they also need to understand the fundamental principles driving those calculations so they can effectively explain their findings to others, assess the value of new techniques as they arise, and modify techniques successfully as necessary.	Noted	These statements are already represented in outcomes, therefore no action
161	009	Appendix C	As you describe in Appendix C, this seems to be higher on the Bloom's Taxonomy Levels than the current objective is written. I would suggest an additional objective addresses this concern.	Declined	Not exactly clear what prefaced this part of the comment. The objectives are not directly relevant. The outcomes are only describing minimum expectations of achievement by students, and the Bloom taxonomy scale of possible kinds of achievement can legitimately allow for additional levels of learning.
162	009	Entrance Expectations	I agree with the comments made several times in this document regarding the importance of work experience in student's contribution and application of the class materials.	Noted	
163	009	Entrance Expectations	I believe the guideline of 2 years is not sufficient. To truly appreciate systems engineering one must have varied experiences within another engineering discipline across the system lifecycle.	Noted	
164	009	Entrance Expectations	I would either expand the work experience requirement from the current 2 years to 5 years or add an additional requirement of 3 years of work experience in two or more phases of the systems lifecycle.	Noted	
165	009	Assessment	While references are made regarding measuring students' attainment of the desired competencies several years post program, there is limited reference to the techniques to accomplish this assessment.	Declined	several reference are made : student survey, employer survey, advisory board.
166	009	Assessment Appendix E	A quick reference is made about conducting a post program survey of participants and their managers but no additional detail is provided in that section in Appendix E.	Copy	see comment 169 related to appendix E
167	009	Assessment	Beyond surveys additional assessments could include: evaluating graduates time to productivity within their new System Engineering role; percent of graduates hired into system engineering roles; and additional training investment of corporations to readiness graduates.	Accepted	Agree. A sentence has been added
168	009	Appendix C	This was well written.	Noted	
169	009	Appendix E	Refer to comment above: "A quick reference is made about conducting a post program survey of participants and their managers but no additional detail is provided in that section in Appendix E. "	Accepted	Details have been added in the table concerning selection of the sample group for assessment
170	009	General	I did have the opportunity to read the full document. Overall I found this document thorough, well structured, easy to apply, and valuable for programs in various states of development.	Noted	
171	010	General	Topics covered are appropriate	Noted	
172	010	General/Industry View	Recommendations are appropriate with the caveat that industry be involved in capstone projects to ensure appropriate level of applicability	Noted	This matter depends on what a particular university implements as 'capstone'. This is a useful comment.
173	010	General/Personal Utility	GRCSE provides a good perspective of the curriculum definition, assessment and objects for SE.	Noted	
174	010	General/Personal Utility	The document provides an appropriate level of detail for a university to begin a SE program with the flexibility and recommendations for tailoring.	Noted	
175	010	General/SE Comm Utility	This document will help formalize the SE domain and ensure that an extensive level of understanding of SE is required for a Masters Degree. As long as industry is aware of these standards, universities adhere to them when developing an SE program, then this can be used a standard for evaluating potential employees.	Noted	
176	010	Introduction	Overall impression of this chapter was that it provided a clear overview and objective for the GRCSE.	Noted	
177	010	Introduction	The chapter clearly outlined what its purpose is and is not, where the focus areas were and how it would be dealt with in the context of this document.	Noted	
178	010	Introduction	The only piece that was unclear to me was section 1.5 GRCSE Outline- specifically Figure 4. The figure appears confusing. For example, what do the different colors of the circles mean? , and the intention of the text next to the arrows was not clear in the figure or the accompanying body text.	Accepted	We will revise figure 4 For consistency with other figures in style and to avoid extraneous content which raises this kind of question.
179	010	Introduction	Recommend accompanying body text include more description of what Figure 4 is intending to convey. Also, where does the value for 50% for the CorBok come from (may need to explain why 50% was chosen and not 40% , 60%).	Accepted	We will revise the text around figure 4 when the figure is revised.
180	010	Introduction	Yes, the motivation is very clear and reiterated throughout the chapter.	Noted	
181	010	Introduction	Yes, I agree with the stated purposes of the GRCSE.	Noted	
182	010	Implementation	This document provides a guide for universities to develop a SE program but is clear to point out that it is only a guide and can be tailored based on university needs.	Noted	

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183	010	Objectives	Objectives appear appropriate for the early career progress (which I am assuming means 2-3 years after graduation).	Noted	
184	010	Objectives	The only change I would recommend is to include that the student should be able to demonstrate some TBD level of leadership in this discipline.	Accepted	second objective amended
185	010	Objectives	Also, have the generic objectives been reviewed by ABET or another accredited organization?	Noted	
186	010	Objectives Outcomes	Outcomes provide graduates with a reasonable foundation to start their career. I don't see anything about hardware - I feel that there needs to be some reference to having an appreciation of hardware engineering.	Noted	
187	010	Objectives Outcomes	Also, what about Quality and Reliability? These are areas that are often overlooked by Systems engineers but integral to product development and life-cycle.	Noted	
188	010	Objectives	The document states that the approach parallels "ABET" but has ABET agreed to this? Need to be careful that if universities use this generic approach then ABET will accept it.	Noted	
189	010	Objectives	Also, Figure 5 is confusing. The body text does take the reader through what the figure is trying to demonstrate but it is still unclear how the program objectives drive the outcomes (at least from just looking at the figure). Also the figure does not show the relationship between the left and right side (assessment), even though the text does take the reader through this. I would recommend updating this figure.	Declined	
190	010	Outcomes	The outcomes work well for industry- particularly the capstone project- teamwork and actually applying what is learned in the Master's Program will provide the student with a great level of understanding and appreciation of system engineering.	Noted	
191	010	Outcomes	Question: How were the correlations in Table 2 defined - what is the reference point? these correlations may change depending on the industry.	Noted	This is a subjective mapping. I do not believe we can do this objectively. I don't think the type of industry actually change this mapping drastically. Therefore no action.
192	010	Entrance Expectations	As the chapter noted, there are no scientific studies to say that 2 years of experience is enough to ensure a minimal level of SE understanding before enrolling in a SE graduate course, however, as long as the experience is relevant and the student has demonstrated (orally or via written) that he/she understands how these experiences can be built on via an advanced degree in SE, then 2 years seems like an appropriate amount of time to gain the appropriate appreciation of SE applications.	Noted	
193	010	Entrance Expectations	Demonstrated practical experience (#2) should be backed up by a supervisors recommendations and support.	Declined	
194	010	Architecture	Curriculum appears to be flexible - this document appears only to provide guidance to a university and does not have curriculum outlined that may limit (or supersede expectations) of what the university can offer.	Noted	
195	010	Architecture /CorBok	50% seems a little high. By the time the student reaches graduate school, the core piece should be already be there and demonstrated as part of the entrance criteria. Graduate school should allow the student a bit more flexibility in working in their chosen domain either through course work or application i.e. capstone project. Maybe a 40/60 split would be more appropriate.	Declined	We believe the 50% is appropriate: to cover the CorBok at the recommended Bloom's levels and to allow flexibility for other topics. Most students will have undergraduate degrees in other engineering areas and will not have much formal SE education.
196	010	Architecture /SEM & SDD	Does SDD include Systems Validation (SDD is really only the left side of the "V" diagram)	Noted	Our interpretation is that SDD also includes the right side of the V.
197	010	CorBoK: Top 10 for "App"	Integration of Process and Product Models, Applying the Systems Approach, System Requirements, System V and V, Fundamentals of Systems Definition, Risk Management, The Nature of SW Engineering, Quality Management, Systems Modeling Approach, System Integration	Noted	
198	010	CorBoK: SEM	Developing Needed SE Capabilities in Teams, Overview of Project Management, Life Cycle Characteristics	Noted	CorBoK - Top 3 - SEM
199	010	CorBoK: SDD	Architectural Design, System Analysis, Mission Analysis and Stakeholder Requirements	Noted	CorBoK - Top 3 - SDD
200	010	Implementa tion	Implementation is useful and provides a starting point for universities to develop curriculum.	Noted	
201	010	Implementa tion	The only recommendation I would make, and is mentioned in this section, is how important it is to keep industry involved.	Noted	
202	010	Implementa tion	Make sure to have a industry representatives from the domains and disciplines that the program will focus on- make sure they assess the curriculum and if possible keep them involved in the capstone projects.	Copy	Comment 201
203	010	Assessment	Suggestions are useful but may be considered too restrictive since you are providing specific examples - recommend making a flow chart that shows a general version of all the steps of assessments that can be tailored for a specific program.	Noted	already done in appendix E
204	010	Evolution	Evolution appears appropriate and has identified the main stakeholders.	Noted	
205	010	Appendix B	Some of the responses back from the survey add up to 100% while others do not- were the responders allowed to circle or provide more than one answer for some of the sections??- if yes this should be noted.	Accepted	
206	010	Appendix B	In general did is good and appreciate the fact the responses will vary- which speaks well with the general recommendations of GRCSE which allows plenty of variation between programs.	Noted	

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207	010	Appendix C	Clear distinction between the various Bloom's levels but there is no description about why this method was chosen over another method or whether other methods were considered. Also some of the levels were never discussed in the context of the GRCSE main text, so is it necessary to have them in the appendix?	Accepted	Approximately one page of material, including a figure, were added in response to this comment to strengthen the justification for use of Bloom's taxonomy in the context of SE education. The Bloom taxonomy discussion is made complete, with all the levels in the taxonomy so that readers can see our recommendations in the body of GRCSE in the context of the whole of one of their key sources.
208	010	Appendix D	Mapping is appropriate for appropriate traceability	Noted	
209	010	Appendix E	This section is excellent. Detail provided is valuable to determining how to assess competency in SE	Noted	
210	010	Appendix E	This is a great section. Provides great detail on the definition of competency, how competency should be assessed and the value of the assessment.	Noted	
211	010	Appendix G	Flow Charts and diagrams that summarizes the use cases are always helpful	Accepted	Use case diagram has been generated
212	011	Maturity	Yes, I might use them to create or modify a masters program in systems engineering.	Noted	
213	011	CorBoK	Yes, it might even provide too much flexibility. It can be confusing to determine whether an existing or proposed program meets the guidelines. Part of this is due to the breadth of the field, but part is due to the presentation of the CorBoK with different levels of attainment for different options.	Noted	
214	011	General	It is a very useful summary of expectations of systems engineering programs.	Noted	
215	011	Objectives	In ABET-speak there are only "Course Expected Outcomes", not "Course Objectives". Similarly, you should use the term "Lesson Expected Outcomes" not "Lesson Objectives"	Accepted	
216	011	Student Background: Experience	It is unrealistic. You should change this to a recommendation rather than a requirement. We have exactly the same problem in software engineering. Most programs that had an experience requirements are dropping them as the market has changed toward more full-time international students who do not have this experience. It would be better if you would explain *where* such experience is needed. You may find that students can learn the material adequately without experience, but that they will need more time to practice them successfully later.	Declined	
217	011	Student Background: Education	Also, you should include at least one semester of discrete mathematics. Several topics in software engineering depend on this knowledge. Most model-based engineering uses it. Almost all engineering programs include this already, but some science programs do not	Declined	This is a niche specialty for software engineering. There is little room to add more general requirements which are currently deemed adequate.
218	011	Architecture	It is too flexible: it is too wishy-washy. You should: estimate how much student contact time should be spent on each of the foundation topics, with the goal of fitting within a budget of about 3 or 4 courses. If this is supposed to be a Reference Curriculum, then provide a strong reference.	Noted	Some of the authors, but a minority, felt that we should include more information on student contact hours for the foundation topics.
219		Architecture	You should propose a set of foundation courses that could be offered by any university	Noted	
220		CorBoK	You should describe the concentrations in terms of non-foundation topics only, do not confuse the reader by mentioning how a concentration will allow students to reach higher levels of achievement	Declined	We think the concentrations will and should provide for a deeper level of knowledge in some areas of the CorBoK. We also believe that describing concentration examples will help readers understand the nature and structure of a concentration. The intent is to be descriptive, not prescriptive.
221	011	CorBoK	Yes, every program needs the rest of the time for their own specialties and issues.	Noted	
222	011	Assessment	This chapter is useless. Appendix E contains everything of value.	Noted	
223	011	Evolution	Looks fine.	Noted	
224	011	Appendix B	It would be nice to show a mapping of CorBoK topics to programs, such as was done for software engineering. That would provide more support for the choices of topics in the foundation area.	Deferred	Agree that this is an excellent suggestion. The full mapping may not be possible, but several schools are working on using GRCSE to implement or update their programs. The plan is to write up some of these observations in a companion document. This is planned for future work for GRCSE (post-1.0 release).
225	011	Appendix C	Only academics care about this. If they don't already understand the taxonomy that's their own fault.	Noted	We believe it is useful for the academic community users of GRCSE to have this as a ready access reference, and to have the specific tailoring to what the levels mean in the specific context of SE through some examples. In addition the second tables for each domain which introduce examples of how the levels may be assessed is useful as a tool assist program and course developers to design assessment to test achievement and as a way for us to communicate what the levels mean in the context of GRCSE.
226	011	Appendix D	It is crucial to any program that cares about assessment. The mapping of foundation topics is most important.	Noted	
227	011	Appendix E	The presentation is good.	Noted	
228	011	Appendix G	I think you have covered all the important cases with the first 3 use cases. You don't really think students will read this, do you? Certainly faculty in other disciplines won't.	Noted	Still believe five use cases is better than three, so no modification
229	011	Program Examples	You need to provide descriptions of example programs and example courses.	Noted	
230	012	Scope	GRCSE covers the right topics. Nevertheless, it should define the links between the described items (such as objectives, outcomes, curriculum architecture, core body of knowledge) and the competencies and roles in Systems Engineering	Noted	

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231	012	Applicability	Recommendation: Address the red path too	Declined	This pathway is unusual and so not developed in full. It is addressed in the text supporting the outcomes and objectives sections, which discusses the particular challenges presented by students without experience.
232	012	Non-Academic Use	A suggestion would be to increase the link between standard SE roles, needed competencies and training	Noted	We believe that this would make GRCSE a much larger document and become difficult to use. Development of such a derivative product may well be useful.
233	012	General	Very good: high level but exhaustive view	Noted	
234	012	General	Very good for the same reason	Noted	
235	012	Chapter 1	It is clear	Noted	
236	012	Motivation/Positioning	Yes, in particular the section 1.5 and figure 4.	Noted	These are included as introductory materials intended to orient the reader. The more detailed writing is distributed in the specific topic chapters.
237	012	Purpose	I agree. Perhaps, it could be beneficial to explain what are the consequences of the differences between blue and red paths and why the red path is not addressed	Noted	In the chapters on objectives, outcomes and entrance requirements there are discussions of how things differ depending on whether students entering a program have experience or not.
238	012	Objective	I think that the given examples help to understand because the generic objectives are very high level objectives.	Noted	
239	012	Objectives	In the second generic objective, it could be interesting to add some examples of roles (Architect, System Engineering Manager, ..	Accepted	
240	012	Objectives	I think that in the third example, "at Ingénieur des Etudes.." should be replaced by "as a Ingénieur des Etudes.."	Declined	I believe that language is correct
241	012	Outcomes	Quite well. Note: Human factors could be in 5-Specialty instead of 11-Related Disciplines	Noted	Agree, but 11 is a better fit, based on the type of examples used in 5.
242	012	Outcomes	English Language could be added	Declined	Do Not agree, this is international document and not US document.
243	012	Outcomes	I would extend 7 Teamwork to Relations/Communication with stakeholders (Internal/External, and co-engineering and collaborative engineering	Accepted	Added appropriate wording to description
244	012	Student Background: Experience	It depends on the education pathways (difference between countries see paths blue and red in section 1. In the case of red path, two years is too long. it can be reduced to an internship.	Accepted	
245	012	CorBoK	I would suggest more than 50% (70 - 80%) because there are many topics CorBoK.It is really important to have good and solid basis.	Declined	We agree that there is a lot of material to be covered, but the recommended Bloom's levels must be considered (e.g., many are not at the application level or above) and the need to allow for program diversity and flexibility.
246	012	CorBoK: Top 10 for "App"	System Life Cycle Process Drivers and Choices Mission Analysis and Stakeholders Requirements System Requirements Architectural Design System Analysis System Integration System Verification and Validation Planning Assessment and Control Integration of Specialty Engineering	Noted	
247	012	CorBoK: SEM	Risk Management Decision Management An Overview of Project Management	Noted	CorBoK - Top 3 - SEM
248	012	CorBoK: SDD	System Modeling Concepts Reliability, Availability, and Maintainability Safety Engineering	Noted	CorBoK - Top 3 - SDD
249	012	Implementation	too generic and high level	Noted	
250	012	Appendix F	Suggested improvement: include a part of Appendix F to underline the link with Competencies models	Declined	See comment #260 which contains the full comment in context and the response.
251	012	Implementation: Additions	examples and measures to monitor the implementation	Deferred	For 7.10 in future revisions.
252	012	Outreach/Tutorials	yes at the INCOSE 2012 International Symposium	Noted	
253	012	Assessment	really more detailed than V0.25. Very useful because addresses every type of assessment with illustrative examples	Noted	

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254	012	Appendix A	yes. Nothing else to add	Noted	
255	012	Appendix B	very interesting, it could be interesting to have the list of universities and programs	Declined	Unfortunately, when we conducted the survey we assured the universities that we would not publish their information. This was done in hopes that programs would be more honest in their responses.
256	012	Appendix C	It is clear and essential because several sections refer to Bloom's levels	Noted	This comment is diametrically opposed to comment #225.
257	012	Appendix D	yes, it is important. It is correlated with the tables in the chapter 6. Replace SED by SDD	Accepted	Made the change
258	012	Appendix E	Essential to understand Chapter 8	Noted	
259	012	Appendix F	It is the only chapter where we could analyse the link between the competencies required for a role and the KSAs. It is essential to link roles with Systems Engineering activities, define the relevant competencies needed to realize those activities for these roles and define the necessary training courses.	Noted	
260	012	Appendix F	include a part of Appendix F in Chapter 7 to underline the link with Competencies models	Declined	The chapter refers the reader to the appendix. Without knowing the specific section or part of the Appendix the reviewer had in mind, the division remains as was previously decided by the GRCSE team.
261	013	Scope	Mostly, I think it will still require a lot of individual customizing: actually a good thing as this is a graduate-level curriculum.	Noted	We agree. Our intention was to provide guidance, but to allow plenty of space for professional judgement by educators.
262	013	Applicability	Yes, for those institutions that have familiarity with ABET style approaches for their undergraduate curricula.	Noted	Familiarity with ABET style accreditation is only one way to learn the language and concepts used by GRCSE as a foundation. GRCSE had to make some assumptions about the educational knowledge of educators in order to be practical.
263	013	Applicability	No, I would need to set up a team to review curricula and make recommendations. I think this might work better for a school that teaches with adjunct faculty who are used to implementing specific courses based on very specific guidance. Professors in a more traditional style setting may find the structured guidance difficult to tolerate easily.	Noted	Not clear how to apply this comment since GRCSE does not make details descriptions of courses. It leaves much in the design detail to the professional judgement of the educators making use of GRCSE.
264	013	Flexibility	yes, it seems to address a broad array of topics and be suitable for local conditions.	Noted	
265	013	General	I find it will be useful more as a model of curricular design under outcomes assessment conditions. It seems that the curriculum leaves out some areas, especially in quantitative adaptive systems analysis. I'm concerned about the reliance on undergraduate style methods of teaching such as the capstone design course for students who have been [comment ends here]	Noted	
266	013	General	Useful as a guide to creating an SE curriculum.	Noted	
267	013	General	There is a deep connection to the INCOSE interpretation of systems engineering and will work best for those users whose thinking is accordingly consistent.	Noted	
268	013	General	I am not all at sure this work cannot be misinterpreted as a training curriculum better suited to certification rather than a master's degree in engineering.	Noted	Anything can be misunderstood, but we are of the belief that the nature of the outcomes and objectives described is such that it represents an education type of program rather than a training level program.
269	013	Chapter 1	Good introduction	Noted	
270	013	Motivation/Positioning	Yes. 1.4 is useful.	Noted	
271	013	Purpose	I think it's a helpful effort to orient SE away from a training type experience to more academic rigor.	Noted	
272	013	Objectives	Yes but I'm not sure you have the right audience for such a degree. It may be that older candidates will better better able to process this type of work, i.e., professional maturity.	Noted	
273	013	Objectives	I think individual departments will have to work with the students on placement. It's a good foundation but a lot of work with advisory committees and employers will be needed.	Noted	
274	013	Outcomes	We do not offer a specific program but it's reasonably consistent.	Noted	
275	013	Student Background	Good but I'm not certain you need any of that to do the coursework described in the BoK. I think a lot of people with any degree who have worked at a national lab or defense contractor can probably do this BoK coursework.	Noted	
276	013	Student Background: Experience	Good idea; some professional experience will be helpful	Noted	
277	013	Architecture	Generally okay although I am unconvinced on the value of the capstone at this level. I teach an interdisciplinary capstone course at the undergraduate engineering senior level and our ability to emphasize systems engineering is often competing with the need to "complete the project." Appropriate safeguards will be needed to insure the SE content. Part-time students who work in the design world will be especially skilled at "completing the project" at any cost.	Noted	
278	013	CorBoK	This is really necessary to have an engineering degree at the MS level. Design work on appropriate systems could be installed in the 50%.	Noted	We expect that programs will include design work in their curricula. Note that System Architecture and Realization are at the Application level for Foundation knowledge and at the Analysis level for the SDD concentration.
279	013	CorBoK	Work in systems simulation and mathematical modeling would be helpful.	Noted	The CorBoK (and SEBoK) includes topics on this area: Part 2 contains KA on "Representing Systems with Models", which includes discussion of system simulation and analytical (mathematical) models.

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280	013	CorBoK	Some faculty members would find the BoK very minimal at the graduate level.	<b>Noted</b>	We believe the CorBoK, which is based on the SEBoK is comprehensive, covering all aspects of systems engineering. GRCSE provides for great flexibility: 50 % on CorBoK foundation and concentration material, and 50% to provide additional depth in CorBoK material and in related material.
281	013	CorBoK	Modeling and Simulation may be useful	<b>Noted</b>	The CorBoK (and SEBoK) includes topics on this area: Part 2 contains a KA on "Representing Systems with Models", which includes discussion of system simulation and analytical (mathematical) models.
282	013	CorBoK: Top 10 for "App"	Life cycle characteristics, mission analysis, systems requirements, architectural design, systems analysis, deployment, operation, configuration management, implementation	<b>Noted</b>	
283	013	CorBoK: SEM	risk management, verification and validation, disposal and retirement,	<b>Noted</b>	CorBoK - Top 3 - SEM
284	013	CorBoK: SDD	representative models, stakeholder requirements, upgrades and modernization	<b>Noted</b>	CorBoK - Top 3 - SDD
285	013	Implementation	It's useful enough for an experienced academic leader.	<b>Noted</b>	
286	013	Implementation	Section 7.10 would benefit from cost analysis along with the cases.	<b>Deferred</b>	For future versions.
287	013	Assessment	Typical assessment process with good examples.	<b>Noted</b>	
288	013	Evolution	A relationship with Institute of Industrial Engineers would be helpful. I suspect this curriculum has much greater relevance in IE/ISE departments than most EE graduate level operations.	<b>Noted</b>	
289	013	Appendix A	Yes, I especially like the scope definition.	<b>Noted</b>	
290	013	Appendix B	There is no useful data in the section. More data would help answer this question [31].	<b>Noted</b>	Not clear what additional data would be helpful.
291	013	Appendix C	I think it does okay for an appendix. I would encourage you to suggest references that would be especially useful.	<b>Noted</b>	The appendix refers to about 12 other works, including the primary works in the area of Bloom's taxonomy. The reader can use the reference list to find helpful references to consult to make use of this work, and the context of references in the text will help the reader distinguish key resources and 'academic completeness' referencing.
292	013	Appendix D	Not too important--I think what you have will be easily modified by most programs.	<b>Noted</b>	
293	013	Appendix E	It's pretty consistent with chapter 8. For an appendix for mostly people who live in the world of academic assessment it provides some useful examples.	<b>Noted</b>	
294	013	Appendix F	It's a good introduction to the authors' intent. I think programs may have more trouble demonstrating achievement than would be obvious but that's to be seen in implementation.	<b>Noted</b>	
295	013	Appendix G	I would encourage something similar to business cases such as those available from Harvard Business School or caseplace.org.	<b>Declined</b>	Agree, there are many ways to do this, but we can only do one, and since this is an engineering document, we decide to stay with the present representation
296	014	General	I completed my review of the (GRCSE) Version 0.5. In general I liked the document; it is much improved and easy to understand.	<b>Noted</b>	
297	014	CorBoK	The only comment I would like to provide (I think I made the same comment previously) is the use of Bloom's Taxonomy. I believe, Bloom's taxonomy is not applicable for engineering education and certainly not for a graduate level education in Systems Engineering. A compressed Bloom's taxonomy Model is recommended as follows. · Level 1 - Knowledge and Comprehension · Rationale: Obtaining and retaining knowledge must include comprehension · Level 2 - Application and Analysis · Rationale: At the MS level analysis is at the core of the application of systems engineering · Level 3 Synthesis and Evaluation - · Rationale: Synthesis cannot be achieved without being able to evaluate alternatives	<b>Declined</b>	We disagree. Bloom's taxonomy (and derivatives of it) is widely used in engineering education. Also, we believe it the most familiar and best understood assessment system. We note that students may enter an MS program in SE with little or no formal education in SE. This is quite different from more traditional MS engineering programs (civil, electrical, mechanical, etc.)
298	015	Scope	Yes. The scope of GRCSE is adequate for a Graduate Course and the body of the document elaborates the scope to be covered in a simple yet effective for people from different backgrounds (industry, academia, government etc.) to understand.	<b>Noted</b>	

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299	015	Applicability	Yes. GRCSE recommendations apply to the educational systems in geographies like US, Europe etc. Though Asia geography is not covered (except Singapore), I would like to provide a perspective here. I come from an Indian educational background where I find the educational systems in general rely more on theory and understanding the fundamentals (rather than repeated experimental knowledge, dissertation and research probably due to lack of adequate infrastructure or trained faculty) except for advanced technical institutions like the IITs, NITs etc. Even in IITs, NITs etc. the research outcome is not much/enough to cover the problems and provide solutions to the country. However they have been successful enough to create a knowledge pool of people who succeed personally abroad. So my recommendation is to ensure that the course covers not only the fundamentals but also adequate experimental experience so that the students are successful in growth markets as well where much scope for creation and improvement of systems is felt.	Noted	The particular implementations of programs are the responsibility of local program developers using GRCSE. GRCSE itself places stress on having an educational method which enables the student to develop outcomes and be prepared to develop to meet objectives, which necessarily stresses the need to be able to act professionally, rather than to only know about SE.
300	015	Non-Academic Use	The need for Systems Engineers is more than the traditional engineers as more automation and robot-controlled functions are applied in current world. Systems Engineers are expected to transcend to levels above single-domain-trained engineers to see the world as Systems of Systems and perform to manage the arising complexity and potential opportunities. In today's world there is no industry that can survive stand-alone and therefore we need Systems Engineers to perform the role of integrators.	Noted	
301	015	General	Personally, in my roles as Project Manager, Operations Manager, Systems Engineering Evangelist within my organization, the understanding of systems will help me more to see all elements I come across as a part of a bigger system and how they can be improved or enhanced to contribute to the 'larger whole'	Noted	
302	015	General	I rate the utility of GRCSE as excellent but the benefits will be felt when the said outcomes are successfully realized and impact the bigger world. Good luck.	Noted	
303	015	Chapter 1	Excellent.	Noted	
304	015	Purpose	Yes. I agree with the stated purpose. But public systems (semi-engineering, semi-human) are seemed to be not adequately covered in the purpose or goals. Is it deliberately excluded from scope? But in the real world, public systems are by far the largest systems and they are growing at faster rates than industry due to more interconnectedness emerging between countries in the world. SEs trained should know how to model real-life or public systems as well.	Noted	We described the content of the program in terms of the SEBoK, which also deals with the 'public systems' area lightly. This comment relates to a matter of content of the program which the SEBoK would need to address in future to have included in a GRCSE assisted program.
305	015	Objectives	Yes. One change is to include how public systems can be modelled in a simple fashion to see areas of improvement as an SE by using available engineering and technology means.	Accepted	
306	015	Outcomes	The outcomes as specified in GRCSEv05 seem to enable SE grads adequately to enter the industry mainstream and move up the ladder fast enough to contribute to complex organizations in larger measures.	Noted	
307	015	General	A Master's degree in SE will surely help to contribute to realizing complex initiatives like say the Smarter Planet initiative of IBM.	Noted	
308	015	CorBoK	Improvements can be done with respect to modelling of public domain systems.	Declined	The CorBok (and SEBoK) does not focus on specific domains, but rather emphasizes SE theory and practice that would apply across a range of domains. A program could easily accommodate a focus on public domains by using the 50% of the curriculum that goes beyond CorBok foundation and concentration material.
309	015	CorBoK	Yes. Practically even if one masters 50% of educational knowledge (but vital and important ones) and knows how to apply it practically in the world (the rest 50%) will be far more effective than others with more theoretical knowledge but don't know how to apply it practically and useful for the larger public. In fact, the present problems are mainly due to the vast disconnect between government-industry-academia interface and utility/benefits/returns expected by public for their investments in each of these 3 units - government, industry and academia. Restricting the ratio to 50% theory and 50% experiential is the need of the hour.	Noted	GRCSE does not explicitly make the 50-50 split between theory and practice. However, students are expected to have prior SE experience and the CorBoK KAs and Topics at the application and analysis levels can only be achieved through some type of practical/experiential learning activities.
310	015	CorBoK	SE for public and community-based systems could be one more concentration. The other 2 is appropriate.	Declined	We agree public/community-based systems would be a good concentration. However, the SDD and SEM concentrations were offered as examples and not meant to constrain or restrict the development of other concentrations.
311	015	Implementation	Very useful	Noted	
312	015	Implementation: Additions	Have Industry and government contacts visit the course and students once in a while to share feedback and sample the effectiveness of GRCSE as it is being implemented.	Copy	201
313	015	Assessment	Very useful. Assessment should include practical exercises that model real-world systems as closely and concurrent as possible. The world changes faster than the models we make to understand them.	Noted	
314	015	Appendix A	Yes. I agree. The principles and guidance adequately cover the systems we see in the material world.	Noted	
315	015	Appendix B	The appendix supports the need very well. Additional data can be procured from public and community-centric systems on what are their needs that can be fulfilled by trained SEs in improving their systems/facilities	Noted	An additional follow-on study is not planned as part of GRCSE. However, the authors would encourage anyone interested to continue the work and would be willing to share data for this type of effort, provided that anonymity of respondents is protected.

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316	015	Appendix C	Very clear. Explanation can be supplemented with visual representation for better understanding.	Accepted	Two figures have been added. The first describes the place of a framework of ideas and methods in the nature of a discipline. The second provides a visual representation of the cognitive and affective domains and their relation to each other.
317	015	Appendix D	Chart form of mapping will be very useful	Noted	
318	015	Appendix E	Very good descriptions.	Noted	
319	015	Appendix F	Has helped to understand the foundation of curriculum development.	Noted	That is the primary intent of the appendix, with respect to competency based development.
320	015	Appendix F	More implementation guidance with details can help directing the efforts better. Examples can be cited to help understand 'how-to-implement' better.	Accepted	Additional text added to summarize examples from several of the references, and references also added which supplement with more research and examples.
321	015	General	A very wonderful and noble effort by the people and teams behind this great effort. The trained SE should not only be system-centric but humanity-centric as well because humanity and the world (earth) are the biggest and complex systems ever seen by us.	Noted	
322	016	Scope	Yes. The Table of Contents is correct considering the existing chapters and appendices	Noted	
323	016	Applicability	It seems to be adequate. All recommendations demonstrate feasibility for our reality.	Noted	
324	016	Maturity	Maybe. Although the richness of its description, assessment could be better thought.	Accepted	The assessment chapter and appendix have been completely rewritten.
325	016	Flexibility	Yes. Recommendations are good and flexible enough to allow tailoring.	Noted	
326	016	Non-Academic Use	Thinking about the companies and local requests, these recommendations can be quite useful to support an informal "assessment" about learning coverage and adequacy of systems engineers available in the market.	Noted	
327	016	General	It is hard to say. I do work with systems, mainly with the software engineering field (leading projects and teaching). Initially, I would rate it useful, thinking on the question 5's answer. Besides, I believe the recommendations provided by GRCSE (as we received from GSWE) demonstrate a contemporary concern regarding courses planning and their quality, what can be applied in different structures and courses initiatives. In fact, I see these both as instances of a quite nice framework to support courses/curriculum organizations, and great opportunity to prepare a new peace of technology to support other areas of science and disciplines. [question 5]	Noted	
328	016	General	I hope the whole community can understand the importance of this work and use its ideas to improve the quality and coverage of their curricula. Not an easy task.	Noted	
329	016	Evolution	It will involve lots of changes and to apply an evidence based approach to market GRCSE will be, in my opinion, cardinal for its acceptance and consensual use.	Noted	
330	016	Chapter 1	It is ok in extension. However, I found some issues that I am sending all of them marked in PDF. It is valid for all chapters and appendices.	Noted	
331	016	Motivation/Positioning	Not sure. I missed some eloquent text showing the strength of GRCSE. Text sometimes sounds "bureaucratic" and only partially describes what some chapters deal with. Maybe to inserting more concrete motivations and examples, discussing the "good" examples obtained through the survey could help. Or, for version 1.0, not sure some "qualitative data" acquired from current courses about GRCSE could be used to improve motivation.	Accepted	This has been addressed through the rewriting of the executive summary in a succinct 2-page form.
332	016	Objectives	It seems ok at this time.	Noted	
333	016	Outcomes	I believe the outcomes represent a nice coverage of consensual requests in the field. However, it should thought about how to evolve outcomes using assessment results.	Noted	
334	016	Outcomes	They are aligned with most our perspectives.	Noted	
335	016	Student Background	Completely aligned. [question 15]	Noted	
336	016	Student Background	Not complicated. We do apply the same criteria. Besides, leveling courses are usually offered for those students needing extra information. This is done without increase the time of course, by offering these courses in parallel with regular disciplines.	Noted	
337	016	Student Background: Experience	Two years is adequate. However, in the way GRCSE describes it the requirement sounds like an obligation of get a job in the field first. This is not always true. For instance, all the engineering students at my university have the obligation of work as trainees in system projects. It can happen in the industry as well as in the labs (that work for industries but do not "hire" the students). Besides, some students work as volunteers for some projects in the country. So, I believe this point could be made more clear.	Copy	see #244
338	016	Architecture	I believe so. It can allow lots of innovation and variation, increasing GRCSE flexibility without making it losing focus. [Question 19]	Noted	
339	016	CorBoK	Quality is a big concern. Shall we think about a specific concentration on V&T for the future?	Declined	We agree V&T would be a good concentration. However, the SDD and SEM concentrations were offered as examples and not meant to constrain or restrict the development of other concentrations.
340	016	CorBoK: Top 10 for "App"	System Concepts, Types of Systems, Representing Systems with Models, Life Cycle Models, System Definition, Systems Engineering Management, Systems Engineering Standards, Systems Engineering Organizational Strategy, Enabling Individuals to Perform Systems Engineering, Systems Engineering and Software Engineering	Noted	

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341	016	CorBoK: SEM	All of these are important to complement management perspectives: Product and Service Life Management, Enabling Teams to Perform Systems Engineering, Systems Engineering and Project Management	Noted	CorBoK - Top 3 - SEM
342	016	CorBoK: SDD	System Realization, System Deployment and Use, Systems of Systems (SoS)	Noted	CorBoK - Top 3 - SDD
343	016	Implementation	It is ok. No improvements for while.	Noted	
344	016	Outreach/Tutorials	No. Unfortunately I will not be able to be at this Symposium. However, would be interest to receive any material yo can make available. Besides, it could be nice to have presentation materials to be used to disseminate GRCSE ideas in the conferences in Brazil and Latin American countries.	Noted	
345	016	Assessment	This chapters needs review. See my comments in the marked PDF.	Noted	
346	016	Evolution	It is ok at this time. Knowledge maintenance is not easy task. Control is an important feature in this point.	Noted	
347	016	Appendix A	Yes. No comments regarding it.	Noted	
348	016	Appendix B	Summary is ok.	Noted	
349	016	Appendix C	Clear enough for me.	Noted	
350	016	Appendix D	Mapping is ok. Not sure the scale is clear enough.	Noted	
351	016	Appendix E	Good description. I believe chapter 8 should emphasize more the existence of this appendix.	Noted	
352	016	Appendix F	I had understood. However, the figure 12 presents a better view of the linkage among different perspectives.	Noted	
353	016	Appendix F	It helps on understing attainment levels and expectations. In fact, appendix E and F should be moved with each other to facilitare reading.	Noted	Appendix E and F will remain 'together'.
354	016	Implementation	Chapter 7 should emphasize more the existence of this appendix (F).	Noted	
355	016	Appendix G	this version althoug simple is ok. Models should be explored to demonstrated the scenarios (for instance, why not use activity diagrams or BPMN to better represent the flows an rules).	Declined	Agree, there are many ways to do this, but we can only do one, and since this is an engineering document, we decide to stay with the present representation
356	016	General	Document is geeting maturity. reading is flowing ok. However, there is unbalance chapters (number of pages, level of details). I believe it will not be complicated to adjust for version 1.0 because most of need information is present in this document. Please, take a look a the PDF file which additional comments and suggestions are presented.	Accepted	The chapters have been reworked, to improve the balance of GRCSE.
357	017	Maturity	I feel that they are getting there. Some elements of the document still seemed a bit "hand-wavy"...see next question/comment.	Noted	
358	017	Flexibility	I do feel that it was flexible. I like that there were two tracks presented, which provided some better focus.	Noted	
359	017	General	Moderate, I am not currently responsible for any System Engineering courses, but my program does have a SysE track and growth toward a Masters in SysE	Noted	
360	017	General	High, it does provide some necessary formalism to the disciplines education as systems engineering likes to be tacked onto existing programs as a bit of a buzz-word to attract an audience without have some of the perceived necessary curriculum elements. [Question 7]	Noted	
361	017	Chapter 1	Overall, I thought it was a reasonable introduction, but the executive summary did a better job.	Noted	
362	017	Purpose	Yes, these were rather clear and appropriate. [Question 10]	Noted	
363	017	Objectives	I think that they provide a nice coverage.	Noted	
364	017	CorBoK	The use of Blooms as a metric is a bit concerning as some in engineering education find Blooms dated...that being said...everyone knows Blooms.	Noted	
365	017	Outcomes	I find they align quite well. With the exception of the first three, these align closely with some of the requirements of engineering for ABET that we follow for our undergraduate SwE, CE, and EE programs.	Noted	
366	017	CorBoK: Top 10 for "App"	Representing System Life Cycle Models: Linear Representing Syste Life Cycle Models: Vee System Requirements System Verification and Validation Quality Management (should be higher than comprehension for all!) Project management Safety Engineering Security engineering Environment Reliability Ethical behavior Planning	Noted	
367	017	CorBoK: SEM	Decision management Mission analysis and stakeholder requirements System Analysis	Noted	CorBoK - Top 3 - SEM

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368	017	CorBoK: SDD	System Analysis System Implementation System Deployment	<b>Noted</b>	CorBoK - Top 3 - SDD
369	017	Assessment	This process is a decent start, but I feel that this really does require significant adaptation to the target culture.	<b>Noted</b>	
370	017	Assessment	Pg 54 and 55, Table 12 does not serve the purpose of the discussion. The discussion says that it shows an outcome is being met, but it does not such thing. It simply shows a plan (as the caption states). Furthermore, the target score provided is not defined...what does 4.0 mean? Not sure.	<b>Declined</b>	Table 12 is a global example of paragraph 1.3. 4.0 meaning is explained in the text
371	018	General	Overall, it'd say GRCSE is good instrument to guide syllabus and course development, could benefit from being developed 'interactively' with user feedback, that is lecturers and students feedback loop, that should enable to some extent sustainable improvement of the curriculum.	<b>Deferred</b>	This can be achieved during the period after release of v1.0 as part of the ongoing maintenance activities.
372	018	General	<p>One item of feedback that I hope you'll find useful is summarised below for your consideration: I recently completed (Doctoral research, thesis defended successfully last month!) an audit of open access research outputs in systems engineering research in the UK Over 100 publicly funded projects in SE research have been audited to evaluate how easily can knowledge seekers, including researchers and students in the field, can access and reuse research outputs using web searches Based on empirical findings, over 50% of publicly funded research projects in SE research in the UK do not share their outputs openly on the web, due among other causes to the existence of knowledge transfer agreements that inhibit and restrict access to publications - making it impossible or very time consuming for researchers and students to access, therefore contribute to the advancement of, the state of the art.</p> <p>A recommendation emerges from the study that the challenges of knowledge sharing, accessing and reusing scholarly research outputs for lecturers and students in the field of SE, in the UK, is noted and where appropriate flagged Two interim publications provide background for this research, although the complete paper has been approved for Phd but not yet published in full: A Systemic Review of Open Access in Systems Engineering ... journals.issn.org/index.php/proceedings55th/article/view/1726by P Di Maio - 2011 - Related articles A Systemic Review of Open Access in Systems Engineering Research. ... A Systemic Review of Open Access in Systems Engineering Research. Paola Di Maio ... Towards a Reference Model for Open Access and Knowledge ... arxiv.org &gt; cs by P Di Maio - 2011 - Related articles Authors: Paola Di Maio. (Submitted on 9 Dec 2011). Abstract: The Open Access Movement has been striving to grant universal unrestricted access to the ...</p> <p>Please let me know if you wish to have more clarification or data or information in relation this recommendation, and more importantly, if you aware of related research opportunities to continue this line of work"</p>	<b>Noted</b>	
373	019	Scope	Mostly. I recognize the GRCSE has as it's focus a Master's Program but there are other types of graduate systems engineering courses out there. For example, some universities provide graduate-level certificates in systems engineering. These programs are usually a year in length; and, they are being paid for by the students' employers who want to improve the capabilities and competencies in the area of systems engineering. The individuals enrolled in these programs may not want to pursue a master's (or another master's); however, they want to understand the current state of systems engineering practice. If they are enrolled in these programs, they are receiving grades at the graduate level and bring their experiences and background into the conversation. I think the GRCSE could be improved to address these stakeholders (students and employers). I am an instructor in such a program and am on the advisory board for the program. They would be useful to help improve the focus of some of the courses. (based on my role as part-time instructor).	<b>Noted</b>	GRCSE was not designed to describe shorter programs, but can still be used as guidance in the development of shorter programs, indicating the areas the broader SE community believe are important enough to need to be included in graduate level SE education. In the 1 year certificate format the level or breadth of expectation would be constrained, but the need is probably somewhat similar. Since GRCSE is not written as a prescription it would be usable in such non-target purposes.
374	019	Flexibility	We could use it as general guidance but is not directly "translatable" to the graduate-level courses for short-term certifications in systems engineering. (based on my role as part-time instructor).	<b>Noted</b>	Interesting point. We did not design GRCSE with a view to supporting short-term training courses, but rather for the design of Masters programs. We recognise that these teaching contexts are very different, and are not surprised that GRCSE is not directly applicable. Training courses are 'out of scope' of GRCSE.
375	019	Non-Academic Use	if the GRCSE was extended to include graduate-level certificate programs this would allow employers to use this as model for programs it may develop or have developed for them by an academic institution. These programs would allow continued development and knowledge refresh of current employees. These programs could be a "draw" for prospective new employees.	<b>Noted</b>	This was out of scope for GRCSE, but close enough to the in scope goal that users could make appropriate adjustment to the various expectations to adapt GRCSE to fit this need.
376	019	General	As currently written, the GRCSE provides me with insight into what I may need to strengthen and gives me a perspective on what I may want to include in my personal development plan (long-term learning).	<b>Noted</b>	
377	019	General	In general it is of utility; however, it makes an assumption that the master's program is the only answer to the development of practical and integrated SE's. There may be another level, granted less theoretical, that may help bridge the gap that currently exists and will exist into the future for developing individuals so they have a "systems thinking" and "problem solving" perspective.	<b>Noted</b>	This matter is out of scope. Others can use GRCSE to inform their other, different needs.

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378	019	Chapter 1	Good. Provides insight into the background and provides context.	Noted	
379	019	Motivation/Positioning	I do not think it positions GRCSE well for all market conditions [Reference Reviewer 019 comments re: Incorporatino of certificate programs]	Noted	
380	019	Purpose	In general, I think it is good to have a "formal" education path. Personally, I went back to University and worked full-time as an experienced Systems Engineer (30+ yrs) to shore-up my Engineering and Business acumen (received a dual-degree: M.S. in Systems Engineering plus an MBA in the same program. However, I do not believe that is the path for many systems engineers; I am concerned that the formality of the Master's program may limit the diverse thinking processes and insights that may be gained from those who do not want a Master's degree.	Noted	This comment relates to a matter outside the intended scope of GRCSE.
381	019	Objectives	The objectives to help develop system engineers more are very worthwhile. The GRCSE will help academic insitutions become more practical and less theoretical in their approach to teaching the subject. The problems to be solved in the real world are complex and highly dependent on the business environment; the stated objectives lead one to understand that affordability, utility to the end-user, and supportability must be considered.	Noted	
382	019	Objectives	I suggest that the objectives be broadened to include not only early career professionals (5 to 8 years) but mid-career professionals (7 to 15 years) as well. I believe that society in general does not provide opportunities for mid- and late-career professionals to more fully develop their skills so they can continue to contribute effectively as well as with current knowledge. I believe that in limiting the objectives to earlier career professionals the currently stated objectives of the GRCSE do not address the "cultural change" needed to help get over the "but, we've always done it this way" issue. Young professionals listen to mid- and late-career professionals (engineering and management) and are influenced by the behaviors and attitudes of those with more experience. If the GRCSE objectives were broadened to include "certificate programs" then maybe the "more mature" audience would have a chance to learn in a "safe" setting instead of being concerned that any mistakes might cost their employer (either financially or by reputation).	Declined	
383	019	Objectives	I think the outcomes help graduate understand the need for a holistic approach to what they might have considered "only a technical problem". I think these outcomes will help graduates have insight into the complexities of the life-cycle and the need to be responsible for the society as a whole - including global responsibilities.	Noted	
384	019	Outcomes	I would expect someone with a Master's degree in systems engineering to have understanding of the business aspects related to the technical decisions. I would expect a new graduate ot have an understanding of how having systems with software are more complicated than those that don't.	Accepted	I believe the first part is addressed with outcomes 8 "problem/solution evaluation" and outcome 9 "requirement reconsolation". The second part is addressed with outcome 12 "software in system".
385	019	Outcomes	I would hope that someone with a Master's degree in SE would have an appreciation and isight into the issues involved with working in a team -- and that you must consider the "greater whole" so that it is optimized instead of the various elements being optimized at the cost of the whole.	Noted	I believe this is already addressed in the existing outcome 7.
386	019	Student Background	With regard to the SE certificate program [see rewiever 019 comments on certificates]: the background expectations align.	Noted	
387	019	Student Background: Experience	The two years of experience is very applicable.	Noted	
388	019	Student Background: Experience	I suggest that in lieu of full-time experience, that the criteria include any time that the student may have had as an intern while an undergraduate (we may see more and more internships and cooperative programs due to the increasing cost of university education).	Copy	see #244
389	019	Student Background	I believe the ability to communicate clearly and effectively in the primary language of the academic insitutions market environment is imperative.	Noted	
390	019	Architecture	I believe the architecture if flexible enough. I would like to see not only the capstone project but also a longer-duration pre-capstone project include in the architecture. I think that [end of reviewer comment]	Noted	
391	019	CorBoK	Yes, it provides flexibility for the academic institution as well as individuals pursuing the Master's in SE.	Noted	
392	019	CorBoK	SEM and SDD are appropriate.	Noted	
393	019	CorBoK	I would suggest that Systems Architecture be added. Many times the "up front" work of the architecture is not well-addressed and it is in this stage of the life-cycle that a lot of impact in later life-cycle stages occurs.	Declined	We agree Systems Architecture would be a good concentration. However, the SDD and SEM concentrations were offered as examples and not meant to constrain or restrict the development of other concentrations.

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394	019	CorBoK: Top 10 for "App"	<ol style="list-style-type: none"> <li>1) Overall project management (and it's relationship to the higher "program" and "portfolio" management concerns</li> <li>2) Architectural approach to Systems of Systems</li> <li>3) Socio-Technical Features of Systems of Systems</li> <li>4) Capability Engineering of Systems of Systems</li> <li>5) Stakeholder requirements analysis &amp; mission analysis</li> <li>6) Integration of the VEE model</li> <li>7) Systems Thinking</li> <li>8) SE &amp; Project Management Similarities and differences</li> <li>9) Systems Validation and Verification</li> <li>10) Capability Updates, Upgrades, &amp; Modernization</li> </ol>	Noted	
395	019	CorBoK: SEM	<ol style="list-style-type: none"> <li>1) Integration of Product and Process Models (tight integration of these two aspects can affect the affordability for a system of interest as well as help with downstream (latent) error prevention)</li> <li>2) Architectural Design (this affects how the WBS and cost-tracking systems are established; it also can affect how to estimate future costs)</li> <li>3) Information Management (the ability to ensure capturing the right data at the right time so that knowledge-based decisions can be made is essential to the application of SE. Too many times, I've seen wasted effort and increased frustration in the work-force because systems engineers do not know how to take advantage of information management to help them ensure timely communication and coordination with appropriate stakeholders).</li> </ol>	Noted	CorBoK - Top 3 - SEM
396	019	CorBoK: SDD	<ol style="list-style-type: none"> <li>1) Fundamentals of System Definition (basic overall knowledge of the iterative and recursive nature of the design is many times not well-understood; also, it is valuable to know that what an SE does in the early life cycle can impact how the Project/Program is run)</li> <li>2) Mission Analysis &amp; Stakeholder Requirements Analysis (the need for elicitation and negotiation during this phase is not well understood, if this aspect can be brought out along with techniques provided in SE Handbook Sec 4.1 it would be very valuable)</li> <li>3) sSystem Requirements (the "full" bi-directional and "through-time" traceability of requirements and technique for the analysis and allocation of those requirements to the various parts of the architecture is not well understood by new engineers and sometimes is not appreciated by design engineers with experience but that are transitioning into a systems engineering role).</li> </ol>	Noted	CorBoK - Top 3 - SDD
397	019	Implementation	The basic areas of the guidance are good. I feel that the area of continuous improvement could be enhanced - perhaps through examples. However, this enhancement may come through time as there is more experience gained and lessons learned provided.	Noted	
398	019	Outreach/Tutorials	Yes, I am interested. I would like to attend the CSER virtually if possible. Also, I suggest that GRCSE also be included as a topic or tutorial in the 2013 International Symposium.	Noted	
399	019	Assessment	In general I think it is a good start. I believe it needs to be more tightly associated with continuous improvement. I believe a weakness that many assessment programs have is that they tend to "assess for assessment's sake" and not use the data and the information developed from the analysis to drive improvements.	Noted	I agree. Link with continuous improvement is done in appendix E and in chapter 7.
400	019	Evolution	In general the evolution of GRCSE works for me... learning and incorporating knowledge gained in earlier stages is important.	Noted	
401	019	Evolution	One of the evolutionary areas I would like to see incorporated is to have a non-master's (but graduate-level) certificate that would help currently practicing (mid-career at least) engineers become more aware of and familiar with the tools and techniques that we as systems engineers have an appreciation of.	Declined	Out of scope
402	019	Appendix A	NOTE: Someone recently told me that they had a better appreciation of systems thinking and how systems engineering would benefit programs because I had provided the example and shown teams that "systems engineering" principles could be applied in a day-to-day sense. (Previously, the experience of the individual had been that systems engineering as they had seen practiced had not added value and had been a drain on the resources).	Noted	Believe the spirit of this comment is that we need to explain the value proposition for Systems Engineering for "everyday activities" more clearly. Whether this is appropriate to do this in GRCSE, and where, needs to be discussed
403	019	Appendix B	Based on my limited exposure, I think it supports it. Again, I fear that the constraint of only applying to a master's degree and not a program that results in a certification may limit the utility and may not accomplish the goals.	Noted	
404	019	Appendix C	Not having been exposed to Bloom's levels in the past, I appreciate the effort the Author team has made to correlate/map the educational concepts and terminology with the Systems Engineering terminology.	Noted	
405	019	Appendix G	I would like to see the use case developed for a non-Masters but practitioner level certification.	Noted	Use case 1 and 2 cover this situation
406	019	Appendix G	The use cases need to include other stakeholders (employers, etc.) -- I feel academic institutions would benefit from this elaboration; and, that it might help the institution help define benefits to the employers. NOTE: this is done in Use Case 5 for students still in their academic life but is not done for the "actual funding" sources for employed students that are seeking reimbursement for their professional development through more formal education.	Declined	Use case 3 satisfy this requirement

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407	019	General	I think it is a GREAT beginning. I like the stewardship concept. I believe SE and it's practice is something that has a come a long way but the journey has just begun. I appreciate the author team and all their efforts.	Noted	
408	020	Non-Academic Use	It should be a great help in creating in-house SE development and training. I would then expect that as a by-product of having a good SE training program within the company (possibly supplemented from outside) this would lead to better employee retention of SEs. Having a reputable SE stable should enhance company recruiting of future SE talent.	Noted	This matches our hopes.
409	020	General	Quite useful. The structure lends itself to be useful for both the academic population and the industrial population.	Noted	
410	020	Chapter 1	Well written, good explanation of what is to come in the document.	Noted	
411	020	Motivation/Positioning	Yes, solid front end.	Noted	
412	020	Purpose	Yes, sharing a framework with which to grow a tailored curriculum for application enrichment is a great formulation for SE Education. SE's must have some practical application experience to be effective in the future and this framework allows to enhance their experience while giving the basic training tools.	Noted	
413	020	Objectives	Objectives seem appropriate.	Noted	
414	020	Outcomes	These outcomes would help prepare the graduate for various SE roles in a company. In the Defense industry the outcomes cover 90% of the non-domain needs. Depending on the early project assignments, the young SE will acquire further skills enhancing his value to the company.	Noted	
415	020	Outcomes	These outcomes would ready the student for most beginning SE work at our company. This would set up the new SE to be useful rapidly in the Defense industry while obtaining local domain knowledge.	Noted	
416	020	Student Background: Experience	Very appropriate. Systems Engineering is a field that requires experience. One cannot effectively practice this profession without some experience in engineering at least if not Systems Engineering. In the past one advanced their career through varied experiences where today some of this is trying to be supplemented in the classroom.	Noted	
417	020	Architecture	I think it can be flexible for most university programs.	Noted	
418	020	CorBoK	50% of the curriculum for core material seems adequate to me. There needs to be plenty of room in the curriculum for other subjects and this does that.	Noted	
419	020	CorBoK	SEM and SDD are reasonable. One could consider having concentrations on Integration or CONOPS (Concept of Operations).	Declined	We agree these areas would be good concentrations. However, the SDD and SEM concentrations were offered as examples and not meant to constrain or restrict the development of other concentrations.
420	020	CorBoK: Top 10 for "App"	1-What is a System? 2-System Modeling Concepts 3-Overview of Systems Approach 4-Life Cycle Characteristics 5-Fundamentals of System Definition 6-System Requirements 7-System Analysis 8-System Integration 9-Operation of System 10-Risk Management	Noted	
421	020	CorBoK: SEM	1-Measurement 2-Decision Management 3-Planning I feel these 3 are crucial in learning how to manage a Systems Engineering Project. When combined with the Foundation top 10 (question 22) yield a well rounded individual ready to learn the domain for the company where he works.	Noted	CorBoK - Top 3 - SEM
422	020	CorBoK: SDD	1-System Context 2-Synthesis of a System 3-Architectural Design These items are crucial for the learner to become more familiar with the needs of Designing and Developing a system. To build a good system the SE must understand how it is to be used and what the interfaces to the surrounding environment are. As the fundamentals of the design are begun, the architecture of the system should be laid out early in the design process.	Noted	CorBoK - Top 3 - SEM
423	020	Assessment	Good example to follow to suggest assessment techniques and methods.	Noted	
424	020	General	The document is in pretty good shape and offers many ideas and much guidance to a University wanting to set up a MS SE program. Of course other entities could use sections of this (e.g. objectives and outcomes) to set up company or government unit training for SE's.	Noted	
425	020	Implementation	Adequate	Noted	
426	021	General	I would like to congratulate the authors for the impressive evolution between 0.25 and 0.5. I like this new version of GRCSE.	Noted	

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427	021	Objectives	PI.3. A systems engineer is an ... engineer. Among the generic objectives, It could be interesting to note that the objectives 3. (Demonstrate professionalism...) and 4. (communicate...) are applicable for every engineering master's graduate.	Noted	
428	021	CorBoK	In the same manner, the knowledge areas in part 5 (enabling SE) are very interesting but the basic models and methods may be generic for every new product development project, and they may be particularized for an application to SE projects (capabilities, teams, individuals ...).	Noted	
429	021	General	Thank you again for this significant contribution in SE teaching.	Noted	
430	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables. 1. Every knowledge area seems to be obligatory. You have defined no option that may depend on the orientations of the master's program (for instance, the applications of SE).	Declined	The CorBoK is intended to account for only 50% of the curriculum; a program has flexibility to focus in more depth on some part of the CorBoK or some other material.
431	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables.2. I do not see where you recommend teaching concepts related to "Procurement/Acquisition".	Modified	The CorBoK (and SEBoK) includes topics on this area: Part 2 contains a KA on "Systems Approach", which includes discussion of acquisition and supply; and Part 6 has added a KA titled "SE and Procurement/Acquisition".
432	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables. 3. I am afraid that the basic heart of SE may receive too little attention. I mean, 28% of the time will be spent in contact hours for learning "system definition", "system realization" and "SE management" (that seems to correspond to the project processes in the ISO 15288 Standard). I will recommend increasing this rate (at least 40%).	Modified	The GRCSE team discussed this review comment at length. The % are offered as rough estimates that curriculum designers can use to judge breath/depth coverage of CorBoK KAs and topics. We have added wording to caution GRCSE users to be careful about a direct mapping of KA percentages to specific courses. Topics can spread across many courses, and a single course may address many topics from various KAs. As an example, one might offer a course in system architecture that would surely cover topics from systems architecture, but it would draw on additional topics from other KAs (e.g., systems concepts, the systems approach, systems modeling, life-cycle processes, SE standards, V&V, software engineering, and engineering issues related to reliability, performance, maintainability, safety, security, etc.
433	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables. 4. Other knowledge areas that have been evaluated with the level either "knowledge" or "comprehension" do not correspond to the learning of skills (by practicing a real project, by solving industrial problems, ...) but rather to the learning of knowledge only (by reading books or by attending courses). I am afraid that it could be boring for students. Recommendations of learning techniques for each knowledge area would be greatly interesting. Future work (after the GRCSE project) could aim at developing teaching supports like industrial case studies, web-seminars presented by SE experts of these knowledge areas.	Deferred	This a good point. We will consider this issue.
434	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables. 5. I do not understand the bloom levels in table 5 concerning "Life cycle models". Application should be related to activities. However, I think that this knowledge area is overall related to concepts. I would replace "application" by "comprehension".	Declined	The point is not just that graduates should comprehend life-cycle models, but be able to use/apply/adapt them in Systems Engineering projects.
435	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables. 6. I do not understand the bloom levels in table 5 concerning "SE Management" for the SDD profile. Every systems engineer should be able to apply SE management methods or tools. I would replace "comprehension" by "application" (OK for analysis in the SEM profile).	Declined	We disagree. This may be the case for some SDD, but we believe "comprehension" is an appropriate minimum for most.
436	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables. 7. I do not understand the bloom levels in table 6 concerning "systems of systems". I would replace "knowledge" by "comprehension". I think that the SEM profile will require this level too.	Accepted	Bloom's level have been changed to Comprehension (SDD and SEM) for SoS.
437	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables. 8. I will hesitate between "comprehension" and "application" for the SEM profile levels in table 7 concerning "enabling teams to perform SE" and "enabling individuals to perform SE". Why only "team dynamics" scored to "application".	Accepted	We agree and have changed some of these topics to the Application level.
438	021	CorBoK	Tables 4 to 8 are a key contribution of GRCSE. I will focus my comments on these tables. 9. Do you check the consistency of table 24 and previous tables? You should clarify the links and differences between these tables. Strong = Analysis? Medium = Application? Weak = "comprehension or knowledge"?	Noted	
439	022	General	I have read through the entire document, especially 6 Core. I find that I have no constructive comments. I generally like the framework and approach. My interests are at the detailed level of the subjects. Good luck	Noted	
440	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 1. Estimation: A Paradigm Shift Toward Dynamic Design-to Cost and Radical Management Volume 13 Issue 2 of SQP journal - the March 2011 version. <a href="http://www.gilb.com/tiki-download_file.php?fileId=460">http://www.gilb.com/tiki-download_file.php?fileId=460</a> <a href="http://www.gilb.com/tiki-download_file.php?fileId=470">http://www.gilb.com/tiki-download_file.php?fileId=470</a> Slides: For BCS SPA, London June 1 2011, By Tom Gilb	Noted	

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441	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 2. Agile Principles Revised -for stakeholder value focus <a href="http://www.gilb.com/tiki-download_file.php?fileId=431">http://www.gilb.com/tiki-download_file.php?fileId=431</a> Agile Principles in AgileRecord.com, no. 3, 2010	Noted	
442	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 3. Agile Values Revised - for stakeholder value focus <a href="http://www.gilb.com/tiki-download_file.php?fileId=448">http://www.gilb.com/tiki-download_file.php?fileId=448</a> Agile Values in AgileRecord.com, no. 4, 2010	Noted	
443	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 4. What is Wrong with Requirements Methods? <a href="http://www.gilb.com/tiki-download_file.php?fileId=443">http://www.gilb.com/tiki-download_file.php?fileId=443</a> Journal Paper <a href="http://www.gilb.com/tiki-download_file.php?fileId=475">http://www.gilb.com/tiki-download_file.php?fileId=475</a> (slides June 27 2011 London SPIN)	Noted	
444	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 5.Engineering Productivity: some ways to measure and manage it. <a href="http://www.gilb.com/tiki-download_file.php?fileId=144">http://www.gilb.com/tiki-download_file.php?fileId=144</a> Engineering Productivity Paper Engineering Productivity Paper Published <a href="http://www.coremag.eu">www.coremag.eu</a> Oct 2010	Noted	
445	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 6. Our new paper Agile Planguage Just out, Jan 6 2011, in Agilerecord.com <a href="http://www.gilb.com/tiki-download_file.php?fileId=39">http://www.gilb.com/tiki-download_file.php?fileId=39</a>	Noted	
446	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 7. User Stories <a href="http://www.gilb.com/tiki-download_file.php?fileId=461">http://www.gilb.com/tiki-download_file.php?fileId=461</a> User Stories paper by Tom and Kai Gilb In Gilbs' Mythodology Column, Agilerecord.com March 2011. This appeared in RQNG Newsletter 26 April 2011. NDC User Story Workshop Slides, June 2011, with Tanning Example <a href="http://www.gilb.com/tiki-download_file.php?fileId=469">http://www.gilb.com/tiki-download_file.php?fileId=469</a>	Noted	
447	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 8. (New 18 April 2011) Core Magazine <a href="http://homepage.mac.com/tomgilb/filechute/Quantifying%20Management%20Gilb_core3.pdf">http://homepage.mac.com/tomgilb/filechute/Quantifying%20Management%20Gilb_core3.pdf</a> Quantifying Management BS: forcing IT Stakeholders to reveal the value they really want from your IT Project.	Noted	
448	022	References	Here are some recent. 2010-2011, papers, slides, video I'd like to share with you, and a digital copy of my Competitive Engineering book (bottom part this mail signature) 9. ""Real Architecture: Engineering? or Pompous Bullshit?"" Talk Held at Javazone Oslo, 8 Sept. 2011 <a href="http://vimeo.com/28763240">http://vimeo.com/28763240</a> <- The Video , 1 hour <a href="http://www.gilb.com/tiki-download_file.php?fileId=480">http://www.gilb.com/tiki-download_file.php?fileId=480</a> <- The slides There are more papers and slides at <a href="http://www.gilb.com/downloads/">www.gilb.com/downloads/</a> Including a book by Kai Gilb on the 'Evo' method <a href="http://www.gilb.com/tiki-download_file.php?fileId=27">http://www.gilb.com/tiki-download_file.php?fileId=27</a>	Noted	
449	022	References	A digital copy of Competitive Engineering (in 3rd Printing, 12/08) is for the moment available at <a href="http://homepage.mac.com/tomgilb/filechute/%20%20Gilb%20Competitive%20Engineering%20Book%20copy%201.pdf">http://homepage.mac.com/tomgilb/filechute/%20%20Gilb%20Competitive%20Engineering%20Book%20copy%201.pdf</a> RESTRICTIONS ON USE: this is only for use of people reading my email! Do NOT post book or link on a public site. But you can share the CE copy with directly selected friends!). The link may be removed or moved/changed at any time, so it is not referenceable in the long term. PLEASE DO NOT TWITTER OR BLOG THIS LINK. IT WOULD VIOLATE MY PUBLISHER CONTRACT. IF YOU WANT TO PUBLICIZE SOMETHING THERE ARE 2 CHAPTERS DOWNLOADABLE <a href="http://www.gilb.com/tiki-download_file.php?fileId=26">http://www.gilb.com/tiki-download_file.php?fileId=26</a> (CH 5 SCALES OF MEASURE) AND CH 10 Evo <a href="http://www.gilb.com/tiki-download_file.php?fileId=77">http://www.gilb.com/tiki-download_file.php?fileId=77</a> not to mention 100+ downloads at <a href="http://www.gilb.com">gilb.com</a>	Noted	
450	022	References	YOU MIGHT ALSO ENJOY THE FULL CONCEPT GLOSSARY <a href="http://www.gilb.com/tiki-download_file.php?fileId=25">http://www.gilb.com/tiki-download_file.php?fileId=25</a>	Noted	