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Framework for identification of curriculum gaps: A systematic approach

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***Abstract*— With the rapidly evolving technology, academics and curriculum developers experience criticism for the curriculum being outdated or unable to meet industry requirements. Additionally, the stakeholders involved in curriculum development have divergent views. Therefore, the challenges lie with academicians imparting the necessary skills and preparing the students to be industry-ready. This study takes a closer investigation of the predecessors of the curriculum gap and classifies it into preceding gaps, viz. information gap, benchmarking gap, perception gap, and learning gap. Prior research has focused on overcoming the curriculum gap, while the current study attempts to propose a framework for methodically identifying the curriculum gap. The paper follows online desk research. The framework is developed based on the multidisciplinary literature and thus provide a comprehensive view of the curriculum gap. Hence the study relies heavily on secondary sources of data. The framework transpired from the literature survey of engineering, management, accounting, nursing, and medical sciences disciplines. It, therefore, lacked affiliation to a specific field of study. Also, the stakeholder's role in the framework may not be appropriate in all contexts as their functions vary within a subject domain and may not exist in some cases. A systematic investigation of the curriculum gap will emphasise the shortcomings in the curriculum, which will assist the faculty in moulding their subject to meet the expectations of stakeholders. The proposed framework aims to expedite the collaboration between the stakeholders and develop a shared vision among all affected. Furthermore, the framework presented benefits academics and curriculum developers by bettering the courses offered and bridging the academia-industry skills gap.**

***Keywords*—** Benchmarking gap; Curriculum gap; Curriculum developers; Information gap; Learning gap; Perception gap; stakeholders.

***JEET Category*— Research**

I. INTRODUCTION

The curriculum gap is broadly described as the disparity between the intended and implemented course (Atibuni, 2020). With the advancement in the business landscape, academicians and curriculum developers are constantly faced with matching industry expectations of graduates to curriculum development and delivery (Almaleh et al., 2019). Due to the program constraints, students are least influenced by the newly introduced courses aiming at the curriculum gaps (Gannod et al., 2005). The skill gap emerges predominantly during the graduates' confrontation with their employers (Gammie et al., 2002). "Employers no longer recruit simply based on degree status. A degree may be necessary or desirable, but graduates will need to develop a profile of attributes that suit them to work in the organisation of the future" (Harvey et al., 1997). The Government of India has also recognised the necessity for graduate skills and has entrusted Skill Development Cell India to train the youth through All India Council for Technical Education (AICTE) approved institutions.

Klein (1992) deliberated on diverse bases for the development of curriculum gap such as (1) wanting to retain the status quo needing little efforts on practitioners' end, (2) absence of rewards for the improvement proposed, (3) institution's cultural defiance to substantial curriculum changes, (4) access to theorists' work published in journals and comprehension gap of practitioners, (5) lack of resemblance in the socialisation of theorist and practitioners, (6) practitioners acceptance of idea being purposeful, (7) ambiguity of the terms, curriculum theory and practice, (8) outlook of curriculum development as a smooth process rather than inquiry modes, (9) development of curriculum theory and function, and (10) theorist advocating curriculum conceptualisation and practises against the traditional approaches followed by the practitioners. Faculty experts decide the course content extemporaneously, though curriculum design and modifications are indispensable aspects of university affairs (Azasu & Gibler, 2016). A disciplined and systematic approach in redesigning the curriculum is encouraged rather than merely adding new courses (Gannod et al., 2005). We consider the systematic approach shouldn't be limited to redesigning the curriculum or adding a new course but should embark on gap analysis. This is

possible when a more purposeful gap framework is at the heart of the course design. Our framework aspires to spotlight the shared concern of the majority of the stakeholders. The framework elicited from the literature survey on a diverse field of curriculum design such as engineering, management and nursing.

II. BACKGROUND AND RELATED WORK

Gap analysis has received heightened attention ever since it was proposed by Parasuraman et al. (1985) in the services marketing literature. Curriculum gaps uncover the sections of the curriculum which are 'wrong' (Gannod et al., 2005). Davis et al. (2002) opined that "gap analysis may take several forms". Parasuraman et al. (1985) proposed gap 5 in the service quality model as the disparity among expected and perceived service (actual service delivered) by a consumer. Davis et al. (2002) employed the gap analysis method to assess the divergence between delivered service (marketing curriculum) and consumer's (students) perception of the implication of the same in their profession. Fowler (2011) and Tan et al. (2004) highlighted the perception gap between the educators and practitioners on the management accounting curriculum. Peterson (2014) mentioned performing gap analysis through the competency-based curriculum requirements focusing on specific skills or knowledge in Health Information Management.

Fater (2013) recommends referring core competencies and knowledge, skills, and attitude needed in each competency as an instrument for gap analysis in nursing education design. Tanner (2001) argued against competency-led curriculum design due to the steadfast approach centring skill development. "To advance the field, a common ground has to be established among all (educational) programs" (Bires et al., 2012). Howard & Warwick (2013) insisted on the need to record the feedback from various stakeholders for curriculum design.

Crawley (2001) has offered a systematic approach to curriculum design through Conceive–Design–Implement–Operate (CDIO) model. The model is focused on the logical integration of skills into a program that develops requisite KSAs a graduate should possess on completion of the course. Edstrom & Kolmos (2014) compared the Problem-based learning (PBL) and CDIO models in the engineering programme and observed the compatible and mutually reinforcing methodologies. Though CDIO was designed initially for engineering education, Crawley et al. (2014) argue that the model can also be applied to non-engineering programmes. Malmqvist et al. (2016) illustrated the successful implementation of the CDIO model to various disciplines like art, science, business, food science and library science etc.

Prior research has widely focused on the history of curriculum theory and gap (Huenecke, 1982; Klein, 1992; Tyler, 1977), gap analysis approach (Davis et al., 2002; Nordstrom & Shwewood, 1997; Winer, 1998), curriculum theory and practice gap (Harvey et al., 1997; Klein, 1992), the academician-practitioner gap on theory and application (Cavicchi et al., 2014; Howard & Warwick, 2013; Klein, 1992; Pratama, 2015; Repsold & Hemais, 2017), desirable graduate attributes and employability skills (Fallows & Steven, 2000; Gammie et al., 2002; Harvey et al., 1997), systematic approach for curriculum design using CDIO approach (Azasu & Gibler, 2016; Crawley, 2001; Malmqvist et al., 2016), and bridging the curricula-industry skills gap (Almaleh et al., 2019; Ayofe & Ajetola, 2009; Valdes et al., 2017).

There is an obvious necessity to combine the views of interest groups to strengthen the approach for gap analysis. However, the literature survey doesn't prove an all-inclusive view and the methods adopted to identify gaps were subjective. Additionally, most researchers pursued addressing the gap in their respective fields of academics instead of exploring the gap determinants. Thus, what appears mislaid in the literature is the deliberation of a generic progression of curriculum gap identification.

III. ARCHITECTURE OF THE CURRICULUM GAP FRAMEWORK

This curriculum gap framework is designed to facilitate identification, classification and bridging the gap in the curriculum. The model illustrates four significant gaps, i.e. information gap, benchmarking gap, perception gap and learning gap, that academicians should address to bridge the curriculum-skill gap (as depicted in Figure 1). The framework is conceived by drawing cues mainly from the work of Parasuraman et al. (1985).

Stakeholders' perception

Our effort in exploring diverse sources considered by curriculum developers for gap analysis in the literature indicated a range of actors. The sources include employers, alumni, recruiters, students, faculty and web portals. Table 1 provides a summary of the approaches employed in the prior investigations of the curriculum gap. Most of the researchers relied on students as the primary source of responses for their survey, followed by employers and other players. From table 1, it is evident that there is no equitable distribution of participants among various studies. Also, some methods are more favoured than others in prior investigations lacking logical reasoning. We deem this as a shortcoming in the literature and is discussed in the following section.

IV. DISCUSSION

Curriculum redesigning received little thought on identifying, categorising the knowledge and skills required through systematic consultation of stakeholders. Managers (immediate supervisors) attributed the lack of interpersonal skills such as listening, problem-solving skills, effective communication, team player, and negotiation skills among the newly hired graduates to the curriculum gap. Industry experts consider the engineering graduates have inadequate operational competencies and credited this to highly influenced decision making such as the choice of degree programs opted, family

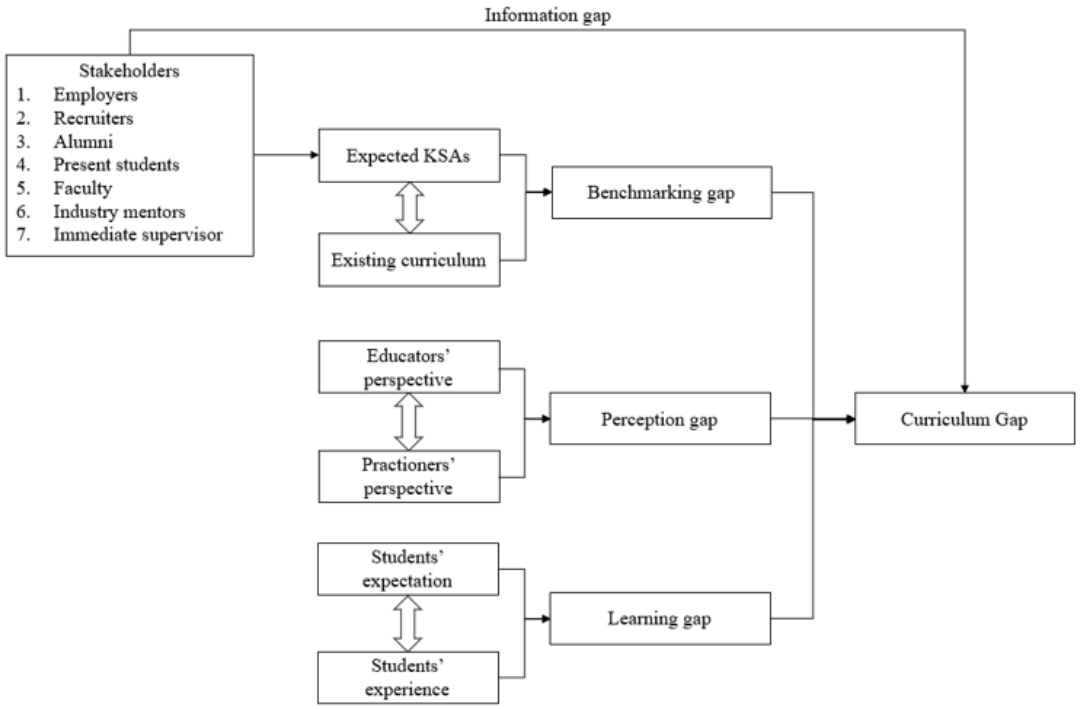

Figure 1. Framework of Curriculum gap identification

compulsion, potential job offers and higher education prospects. Forbes has listed a variety of skills demanded by employers while hiring freshers like an entrepreneurial spirit, innovative problem-solving, understanding of other cultures, risk-taking, adaptability, analytical and quantitative skills, strong work ethics, friendly personality and initiativeness. Peter Cohen, group president of U.S. Education at McGraw-Hill Education, believes that today's employers ultimately "need people that have skills that transcend the educational content they get." Employers specific input on oral communication of new hires revealed demand for competencies viz. proper use of grammar, team communication, meeting involvement, engaging discussions, and fluency in a telephone conversation. Practitioners are also concerned about academic courses being more theoretical and inadequate practical sessions.

A survey by Jiang et al. (1994) shows recruiters preference for self-motivation, effective oral communication and maturity over the domain skills. The author attributed this to a dearth of soft skills training during college education. Rhew et al. (2019) did a content analysis of job advertisements and found significant gaps in soft skills such as "self-management, influencing and persuading". Malmqvist et al. (2016) cited faculty aversion to teaching skills outside their subject speciality and constraints to implementing the CDIO approach to curriculum designing. Faculty have cited students' educational background, personal and professional competencies, language proficiency, and self-organisation before admission for their low achievement.

Alumni employed in the industry cherished skills over knowledge as the latter had less relevance in the early stages of their career. Their study hinted at insufficient preparation of technical and oral communication skills of students. An Alumni survey by Garner et al. (2019) reported high precedence for soft skills such as communication and problem-solving. Perceived disagreements were highlighted among fresh graduates and employers. The graduates believe they have the requisite soft skills like emotional intelligence, professionalism, and leadership abilities, while employers deny them.

Students perceive communication, analytical and self-management as the preferred industry skills during their course delivery. Therefore, instilling the above skills in the university curriculum is imperative for grooming industry-ready graduates. Asefi et al. (2017) noticed a disparity between the students' expected and perceived educational service. Thus, it is encouraged to contemplate students' perceptions to measure teaching effectiveness and emphasise pedagogical changes.

Prior investigations insist on heeding to the voice of all stakeholders and ascertaining the disagreements and similarities, thereby bringing consensus on the curriculum developed. Consequently, we contend that the omission of any stakeholder would confine the scope of curriculum deliberation and could lead to a partisan approach. We conceptualise this as an *information gap* causing curriculum gap identification. Therefore, the curriculum developers should embrace a learner-centred approach in curriculum gap assessment by engaging all stakeholders, although their interests vary in degree and complexity.

"Benchmarking involves first examining and understanding your own internal work procedures, then searching for "best practices" in other organisations that match those you identifed,

TABLE 1: SUMMARY OF CURRICULUM GAP IDENTIFIERS

Methods	Davis et al., 2002	Gannod et al., 2005	Pang & Hung, 2012	Gammie et al., 2002	Woolridge & Parks, 2016	Litecky et al., 2012	Huang et al., 2009	Hills et al., 2003	Mirzazadeh et al., 2013	Almaleh et al., 2019	Pasovic et al., 2017	Stephens & Hamblin, 2006	Com et al., 2018	Harrison & Ajjan, 2019	Bergquist et al., 2019	Ameyaw et al., 2019	Dolezel & Mcleod, 2021	Crombie et al., 2000	Patacsil & Tablatin, 2017	Cardoso et al., 2020
Alumni Survey	×							×												
Student survey	×		×	×					×		×							×	×	×
Employer survey	×											×	×							
Employer interviews													×							
Employee survey (Salespersons)														×						
Recruiter survey	×																			
Focus group (Industry mentors)		×																		
Focus group (subject faculty)		×																		
Focus group (students)		×																		
Focus group (Recruiters and Employers)				×																
Student interview				×																
Faculty interview															×					
Faculty and Practitioners (Action research)																×				
Analyse job postings in print and online media					×		×			×										
Data mining of job portals (Web crawler)						×														
Review of scholarly articles in the online database							×													
Curriculum websites										×										
Survey of association members																	×			

and finally, adapting those practices within your organisation to improve performance". Thus, benchmarking practice aids curriculum revision and benefit the stakeholders. In addition, Benchmarking facilitates in identifying performance gaps and

addressing the gaps. The literature recommends initiating pedagogical changes by benchmarking with peer institutions or following previous offerings. Mohajeri et al. (2009) offered a method for benchmarking process by focusing on the critical roles of stakeholders in an organisation. According to the American Psychological Association (2012), Benchmarking is devised to "tailor a set of competency expectations" that describe the learning outcomes.

Knowledge, Skill & Ability (KSA) competencies broadly describe the level of knowledge, skill, and ability to be attained by a student to complete a course. Palmer et al. (2004) extensively deliberated on the stakeholder engagement in developing KSAs in the accounting profession. A collaboration of faculty with stakeholders is suggested to meet the expectations of all stakeholders affected. Besides, instructors and curriculum developers need to assess skills indicating stakeholders' role is warranted in setting course expectations. However, apprehensions still subsist on reaching a consensus among academicians on the scope of a course and identifying the competencies to be developed.

Additionally, there are concerns about individual interests being a dominant factor in identifying the benchmarking institutions or practises, affecting the KSAs. Benchmarking requires a more significant commitment of time, money, and effort from the institution's end. Further, a lack of professional expertise and awareness could elicit the haphazard application of benchmarking practices. Judd et al. (2013) suggest mulling over benchmarking decision process considering its bearing on the curricular decisions and learning outcomes. Therefore, the study maintains that the fragmented approach in formulating and integrating KSAs in the existing curriculum would result in a gap and may be referred to as *benchmarking gap*. Therefore, the curriculum developers should cognise the likelihood of the curriculum being developed in a prejudiced manner and set a benchmark far from ideal. Moreover, this practice will authenticate a well-balanced approach in curriculum gap identification.

In today's fast-paced world driven by globalisation, technology and intellectual demands, the business has become increasingly complex and necessitate a fair balance between knowledge and skills. Kaplan (1964) described knowledge as the learning that aids in arriving at innovative solutions to novel challenges and is attained vicariously. In contrast, skill is "an underlying ability that can be refined through practice, such as communication, analysis, creativity, intuition, leadership, decision making, and planning" (Shipp et al., 1993). Davis et al. (2002) measured alumni performance by emphasising their skills and knowledge. Their study revealed a greater emphasis on skills during the early stages of a career, while knowledge is valuable as they make a career progression. Nevertheless, "to compete well in the job market, graduates must be equipped with the skills and knowledge required by employers" (Floyd & Gordon, 1998). Broad-based functional knowledge and skills are relevant to an individual, social, and economic welfare instead of comprehensive subject knowledge that is less relevant after graduation. Educators teach skills necessary for a profession, but practitioners want immediately employable graduates matching their job specifications.

Researchers have widely acknowledged the divergent goals and perspectives of educators and practitioners (Bui & Porter, 2010; Fowler, 2011; Tan et al., 2004; Yazdifar et al., 2008). In addition to this, a weak interaction prevails between academicians and practitioners. This triggers conflicting perceptions and priorities among academicians and practitioners. Studies by Manevska et al. (2018) and Rhew et al. (2019) confirms a significant gap between employers' requirements and the curriculum offered. There exists an educator-practitioner gap traceable to the misconception among the two concerning specific competencies and practices. Ultimately limited communication, understanding between the educators and practitioners cause the emergence of the gap. Hence, those accountable for curriculum development should acknowledge the relevance of the content included and the objectives served by inclusion. Management should emphasise good cooperation among educators and practitioners to address the shortcomings of graduate competency. Conversely, a disagreement between the educators and practitioners could lead to arbitrary decisions regarding the knowledge and skills to be discussed in the curriculum. We consider this a shortcoming in identifying the right curriculum gap and addressing as *perception gap*. Curriculum developers must arrive at a consensus on the diverse views of educators and practitioners to pursue curriculum gap identification.

The curriculum broadly deals with the learner's experiences. Consequently, the curriculum design should reflect on students and pedagogy. Competent and satisfied students are critical to the institutions' reputation and progress. Therefore, students are one of the key stakeholders in curriculum development. Students' learning experience necessitates deliberation as it leads to curriculum design. Studies suggest motivated students represent stakeholders in formulating curriculum expectations. However, Shetty (2018) noted students' experience of curriculum expectation didn't match their expertise, denoting a gap. Students are observed to have the least authority to influence the curriculum yet stand to lose the most if poorly designed. Over the years, as the learning gap broadens, these students become passive and indifferent audiences in the class. Further, the stiff competition among universities and colleges occasioned a sharp decline in student enrolment, and there is a necessity to tackle the issue of program quality and services offered.

A participatory approach of stakeholders is warranted for curriculum development to review and enhance the adequacy of suggestions. Students should be given prominence on their concerns about the learning experience for developing a strong curriculum meeting their expectations. Jackson (2020) shared evidence in this regard, where the students wanted the universities to focus on teaching and learning domain over student welfare during the covid-19 pandemic. Student motives such as academic rigour and learning experience impact expectations, perception, and satisfaction. A learner-centred curriculum is advocated to design as students adored more conversations, discussions and beyond the subject books.

There is compelling evidence on the student's expectations of the curriculum and their experience. Deviations from the expectations and pedagogy can widen the gap between the two

and are referred to as the *learning gap*. The onus lies in the curriculum developers addressing the gap, failing which students attribute their negative experience to the instructor, curriculum, and institution.

The gaps, when combined, have a significant impact on the curriculum gap identification. While drawing attention to the issues, the literature also signifies inherent solutions, facilitating collaboration among stakeholders on curriculum gap, incorporating educators' and practitioners' perspectives, and managing student expectations by including their inputs. Curriculum developers need to place the students at the forefront before analysing the curriculum gap. Addedly, stakeholders should consider publicising the sought-after graduate skills among the present students. According to Manish Bahl, Assistant Vice President, Centre for the Future of Work-Asia Pacific, Cognizant, the covid-19 pandemic has created new job opportunities such as Chief Cleanliness Officer, CEO- Cashless Society, Work-from-home Facilitator, and Customer Trust Manager (Mathai, 2020). This suggests pondering over curriculum gap inputs to stay relevant in the dynamic world.

V. CONCLUSION

The study proposes a curriculum gap framework for academicians to be used in curriculum development. The framework offers to address a holistic perspective of gaps to identify the specific curriculum gap. The curriculum developers should address the benchmarking, perception, and learning gaps before pondering over the curriculum gap. Further, the framework facilitates an interface between academicians and other key stakeholders to pursue their individual goals actively. Additionally, it discounts prejudiced views of the dominant players, thus aiding the subject faculty to arrive at a logical conclusion.

Prior studies have extensively mulled over addressing the curriculum gap across disciplines. However, investigations were focused on the opinion of selected key stakeholders and omitted other players. This study fills this gap in the literature by proposing a comprehensive framework encompassing the shared vision of the major stakeholders involved in curriculum development. Our work explores the prior gaps viz. information gap, benchmarking gap, perception gap, learning gap that contribute to curriculum gap. The study argues that curriculum developers should attempt to plug the above gaps to prevent deviations from identifying the actual curriculum gap. Additional investigation and deliberation of this point are merited.

The framework pursued a multidisciplinary review and thus not aligned to any subject areas in specific. Moreover, the stakeholders included in the framework may not hold good in all subjects concerned as their roles may not exist in a particular discipline. However, we consider the framework would strengthen the gap discovery and aid in developing a robust curriculum that addresses stakeholder goals.

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