Building a Digital Business Incubation Ecosystem for a Sustainable University

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Abstract. Sustainable university is instrumental in integrating sustainability principles in all academic and operational aspects of the campus. Students are the centre of the university's sustainability policy. This article discusses a sustainable digital business incubation ecosystem that includes important aspects of the programme, faculty, curriculum, methods, assessment, and outputs. The program is designed to support innovative and responsible business development with eco-friendly facilities and sustainable training. Lecturers act as mentors with digital technology and sustainability expertise. The cross-disciplinary curriculum combines information technology, management, and environmental studies with a project-based learning approach. Learning methods encourage collaboration and the use of digital technology. Assessments include business project evaluations, presentations, sustainability reports, and practical skills. Outputs are created in the form of innovative digital businesses and students who are ready to lead sustainable businesses. The finding reveals that this ecosystem is effective in creating an environment that supports the development of sustainable digital businesses, making positive contributions to society and the environment. This article contributes to providing a comprehensive ecosystem concept for universities, strengthening the role of universities in supporting sustainability, and making positive contributions to community and the environment through the realization of digital business incubation. The integration of these aspects in a sustainable digital business incubation ecosystem enhances the role of universities in supporting sustainability.

Keywords: sustainable universities, digital business incubation, entrepreneurship, curriculum, assessment, sustainability.

1 Introduction

The concept of sustainability in education was first introduced globally in 1975 with the release of the UNESCO-UNEP International Environmental Education Program. The agenda encouraged international declarations on the need to build knowledge and principles of sustainability and was widely welcomed by the education community [1]. Universities play an important role in transferring knowledge to students regarding sustainable development goals (SDGs), how SDGs should work, and solutions to solve

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sustainability problems [2]. Through this role, universities have the potential to improve their approach and leadership to reach the Sustainable Development Goals (SDGs) [3].

Universities indirectly play a role in moulding future decision-makers and leaders. How students are able to effectively harmonise actions, develop partnerships, and intensify efforts to achieve sustainability goal [4]. Therefore, to create a sustainable campus and society for the future, the role and responsibility of the university is required [5–7].

The Government of Indonesia emphasises the need for higher education institutions to provide education on the transition to a sustainable society. The sustainability roadmap outlines how universities and other formal and non-formal education institutions can collaborate to influence sustainable lifestyle change [8]. There are a number of sustainability literature studies evaluating the significant role of universities in building awareness and encouraging environmental behaviour.

The existing research conducted a survey involving 18 experts in the field of sustainable development in order to identify key competences relevant to sustainability [9]. The study identified twelve key competencies, including anticipatory thinking, systemic thinking, and critical thinking. Most higher education institutions have demonstrated commitment to sustainable development by supporting the signing of various international conventions [10,11] examines eleven partnership declarations that reveal universities' commitment to encouraging the effectiveness of educational initiatives for sustainable development. The study concluded that, despite various efforts, the conventional role of universities is still needed in sustainable development.

Recent study reveals that a number of European universities have made significant progress in integrating environmental themes into academic programmes and campus activities [12–14]. Italy, in particular, is sensitive to environmental issues due to the country's high vulnerability to hydrogeological risks and climate change. Moreover, studies indicate that some aspects of sustainability are still not properly recognised at the university level [15]. A study revealed that students at the university level have diverse views, meanings and interpretations of sustainability [16,17]. Students perceptions on sustainability have an impact on their expectations of sustainability efforts and initiatives undertaken by universities [6].

The topic of sustainable universities is interesting and worthwhile to explore and study especially in the aspect of the role of universities developing digital business incubation. It can contribute insights into how the leading educational institutions contribute to sustainable development. How universities are able to educate and engage students towards a sustainable society. Therefore, this research aims to present the concept of digital business incubation as a form of university contribution to sustainability and link it to the responsibility of universities and campus communities towards sustainability. The research findings are useful in implementing ideas corning the digital business incubation development in the university environment towards a sustainable university.

2 Sustainable Universities: High-Education Initiative

Sustainable university is defined as the role of the university in realising environmental conservation and in educating the campus community towards sustainable development [18]. Universities around the world play a role in supporting the achievement of sustainable development goals [19]. The university, as part of an international programme, needs to have its own initiatives to educate students to be aware of, understand and implement a sustainable university program. Most of the universities significant achievements are in environmental programmes, while other dimensions of sustainability are still pending [10,20]. Therefore, it is important that higher education works together to help shape the understanding and implementation of sustainability programmes. This is in accordance with the number 4 of SDGs goal dimension, which declares the educational institutions commitment to take sustainability actions.

Moreover, educational institutions also have a responsibility to increase interaction between the campus community (faculty, staff and students) and external stakeholders (society in general) in addressing and engaging them to solve real problems such as sustainability issues [21]. The universities should not be limited to science, but also grounded in a holistic approach understanding of the principles of sustainability [4,6] recommending universities to have a dialogue with the campus community on what sustainability means and how program objectives can achieve it.

Educational institutions, especially universities, have an essential role in society as they aim to create future experts and leaders. Therefore, universities need to have a strong commitment in supporting the global transition towards sustainable development, as has been defined in many national meetings and international programs [22]. UNESCO has implemented education for sustainable development initiatives to foster greater environmental awareness and promote environmentally sustainable behaviour [13]. The organisation released the Education for Sustainable Development (ESD) framework in 2019 [23] which emphasises on ‘policies, learning environments, teachers and educators, youth and communities’ and aims to enhance education's contribution to achieving the 17 dimensions of the Sustainable Development Goals (SDGs).

The recent UNESCO article ‘The concept of sustainability and its contribution towards quality transformative education’ presents updated recommendations and expands on the goals of the SDGs [24]. It emphasises on education contribution to sustainability by discussing the role of higher education in engaging with recent global challenges that include biodiversity loss, pollution, and climate change. A study emphasised that every form of education is environmental education, because all the learning processes engage environmental aspects [25]. Without this dimension, these processes are meaningless and cannot support human survival [26]. While best practices for sustainability have been adopted around the world, more needs to be done to integrate sustainability values into university programs [11].

The sustained impact of media and information and communication technology (ICT) lies in the understanding of sustainability and environmental issues [27]. When the media takes issues seriously, the public also takes them seriously [26]. Furthermore, ICTs are known to create changes in perception and behavioural processes. Therefore,

raising awareness of the environment in individuals is an ongoing process at the educational levels and requires active and sustainable action. The literature on sustainability underlines the important role of universities in increasing awareness and promoting environmentally friendly behaviour. The latest studies suggest that several European universities have achieved substantial results in integrating environmental themes into their campus programs and activities [12–14].

The adoption of sustainable universities is generally influenced by institutional pressures [28]. Sustainable universities go through several phases of sustainability initiatives including grassroots, executive acceptance, the visionary campus leader and an integrated campus community [29]. In the reality, the promotion of sustainability in universities occurs in a top-down approach, with students only acting as receptors to the policies implemented. [30]. University initiatives in providing progress related to sustainability by utilising the website as a platform to discuss and report on sustainability aspects [31], thus measuring the quality score of the informative sustainability content provided [32]. The research suggests that value-based measures can be developed and integrated into the university's sustainability progress assessment [33]. There are several dimensions of sustainable university implementation, generally focussed on the environmental aspects, while the economic and social aspects are under-reported and rarely addressed [34]. Therefore, effective management by the university contains the 'what' and 'how' of transformation for sustainability especially in the curriculum [35].

3 Entrepreneurship Education

Entrepreneurship education is important for students as an effort to cultivate economic independence, especially after graduating from school and university. Considering the importance of implementing entrepreneurship education, it is necessary to formulate the content in the curriculum. Entrepreneurship education can focus on the development of the whole person, head, heart and commitment to impactful societies [36]. A study reveals evidence that Residential Colleges can form strong linkages of formal teaching, experience learning, socialization and networking to affect entrepreneurship [37]. In addition, the content of entrepreneurship education requires the implementation of the Teen Entrepreneurship Competition (TEC). Sustainability and progress of TEC is closely connected to promoting the building of character at the personal level, promoting partnership development at the organizational level and promoting social commitment at the community level [38]. In recent years there has been a movement from knowing and skills to competencies. There are two types of competencies: professional skills linked to technical competencies associated to vocation, and key competencies for lifetime learning, occupation, social inclusion and individual fulfilment [39]. The most crucial key competencies are a sense of initiative and entrepreneurship.

Entrepreneurship education is not only about the content, but the importance of guidance during the learning process and defining the teacher's role as providing guidance by considering the student's level of proficiency [40]. Empirical studies validate the

integrated ideas of fairness and equality, constructivism, humour, and role-play as principles of learning and elements of delivery in entrepreneurial pedagogy to improve student enjoyment and learning results [41]. The positive outcomes of an educational program for entrepreneurship can stimulate start-up intentions in interdisciplinary students in university [42]. Therefore, in the field of education, students who are at risk are unprepared for this age of entrepreneurship [43]. It's not just the mechanics of how to initiate and develop a new business, or the art and science of discovery and exploitation of opportunities. It is about encouragement and inspiration, where students from around campus are pushed to have big dreams; provided with the tools to make those dreams a reality; being challenged to do bigger things than themselves; and being left to fail. To ensure university programmes are effective, universities need to build ecosystems that integrate programmes, people and ideas from around the university, and avoid the traditional silos created by schools and universities [44].

4 Digital Business Incubation

The digitalisation of business provides a range of benefits not limited to large companies, but also includes startup companies. The development of the digital economy enhances the earning capability of startup companies and the more developed the digital economy, there will be improved the financial performance of startup companies [45]. Existing literature revealed that climate change positively stimulates incubated startups to increase technology-driven sustainable value creation [46]. It means that the orientation of digital business startups includes positive environmental and social impacts, not limited to economic value as an attempt to create sustainability value. There is a difference between technology-based and creative-based entrepreneurs. Technology-based (TB), their tangible capital benefits support evidence of concept, financial grants, and technical and industry-specific knowledgebase capital. In contrast, creative-industry (CI) entrepreneurs benefit by tangible capital that supports product development, small-scale project financing, and knowledge capital focussed on business fundamentals [47]. Relevance to the context of digital business incubation, technology-based (TB) is very important to strengthen external legitimacy to support both conceptually, financially and technically. In carrying out their business activities, digital startups should at least focus on digital strategies, namely having a digital platform, engaging in a digital platform, and transforming traditional businesses for the digital world [48], which in turn have a positive impact on product and process innovation performance [49]. In addition, the importance of the proper leader in directing digital strategy is especially important for startup business. Distinct leader attributes, such as agility, inclusiveness, innovation, and openness, along with leadership styles like democratic and transformational approaches, as well as skills in cognitive, social, technological, and digital domains, are essential for effective business model innovation and organizational change, both of which drive successful digital transformation within corporations [50].

The role of business incubators is critical as mediators to provide network services, equity support, and coaching programs for both the individual and the entrepreneur,

which are essential for entrepreneurial development [51]. There are three pillars of the business incubation model, including entrepreneurship, creativity and innovation [52], This means that business incubation is a strategy that aims to promote entrepreneurship, encourage creativity and facilitate innovation. Other findings revealed that there is a need to emphasise the technology transfer value, tutoring program, innovation and creativity through entrepreneurship and academia [53]. Furthermore, [54] stated that coaching, mentorship, and financial services are considered to be the most essential for designing startups. Emerging entrepreneurs with the business incubation program have improved access to the infrastructure and resources required for entrepreneurial success, thereby increasing their real chances (capabilities) of success [55]. In addition, through incubation and open innovation, it will create a contribution to digital startups [56]. The inclusion of business incubation, especially digital businesses, at least requires skills that must be developed, including innovation, leadership and management [57]. Building a digital mindset is something that needs to be considered. Fostering a mindset of digital growth is crucial to achieving success in the business world for entrepreneurs to stay competitive and succeed in today's business environment [58]. Furthermore, digital technology alone is not enough to make business plan innovation successful, support from sociotechnical factors is also needed and in the transformation it is not recommended to fully digitised all business processes, it is necessary to sustain the conventional analogue character to build value [59,60]. Research shows that when founders, advisors, mentors, and incubator directors engage collaboratively to create recurring discussions that shape the creation of viable business models, the process by which full absorption capacity can be realized is significantly enhanced [61].

5 Sustainable University through the Implementation of Digital Business Incubation

Sustainable university is a concept that integrates sustainability principles in all aspects of academic activities and campus operations. This includes resource management, teaching, research, and community engagement. In this context, digital business incubation plays an important role in supporting the university's sustainability goals by providing a platform for students to develop innovative and socially and environmentally responsible businesses.

The implementation of a sustainable university, especially in the field of digital business incubation, several phases are needed, starting from the grassroots, executive acceptance, visionary university leaders to an integrated university community [29]. Digital business incubation is fundamentally based on three pillars, namely Entrepreneurship, Creativity and Innovation. [52]. Universities as drivers of sustainable activities need to take initiative and be self-sufficient in accommodating sustainability implementation, not driven by institutional pressures [28]. Students are central and a source of aspiration, as they are the ones who will implement the universities' sustainability programmes such as digital business incubation [30]. It is related to the University policy in implementing effective sustainability management that contains the what and how of sustainable transformation, especially in the curriculum [35]. The university needs

to implement digital business incubation, considering the risks faced by students, namely their unpreparedness in the entrepreneurial sector [43]. Universities are required to be effective in their implementation. To make university action effective, it is necessary to create an ecosystem that integrates programmes, people and ideas from across campus and avoids the traditional silos created by schools and colleges [44]. In this article we divide the ecosystem into several aspects, including programmes, teachers, curriculum, methods, assessment and outputs.

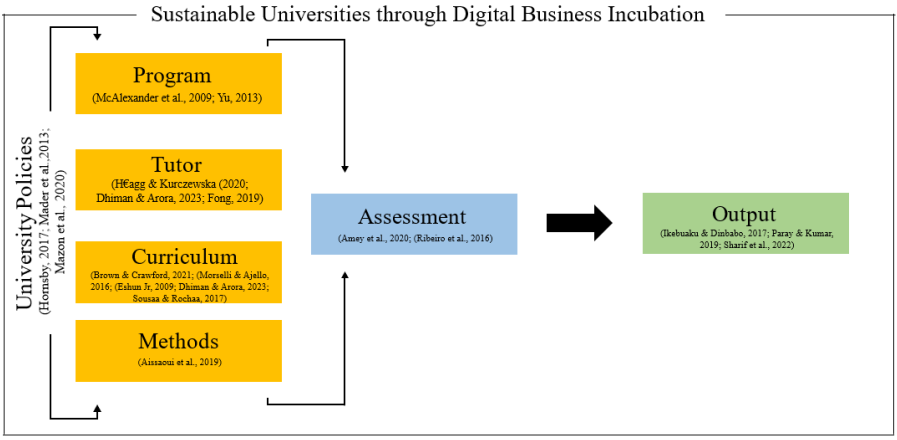

Fig. 1. Conceptual Model

5.1 Program

The digital business incubation programme in a sustainable university is designed to integrate entrepreneurial principles around sustainability. The program includes various initiatives that support innovative and responsible business development. For example, programs that offer facilities such as eco-friendly co-working spaces, access to the latest technology, and resources that support sustainable business practices. The program also provides comprehensive support to students through sustainability-focused training, workshops, and mentoring. Recommended programs that can be implemented in digital business incubation include Residential College and Teen Entrepreneurship Competition (TEC) programmes [37,38]. Residential colleges create strong connections from formal instruction, experiential learning, socialisation and networking which in turn influence their entrepreneurial interests. At the same time, the TEC program is a medium for individual character building, build partnerships at the organizational level and contribute to social commitment at the community level. The options for implementing the program are not limited to these two, but can be developed with relevant programs that can support the targeted outcomes of digital business incubation in the university environment. Therefore, it is important for universities to identify and implement programs that can be adjusted to the tendency and character of students, thus it is important to involve students as the centre in determining policies [30], one of which is suitability in the implementation of digital business incubation.

5.2 Tutor

Tutors in a sustainable digital business incubation ecosystem are required to have high competence in digital technology as well as a deep understanding of sustainability principles. They fulfil the role of mentors who guide students in developing business ideas that are not only innovative but also make a positive contribution on society and the environment. Teachers should be able to facilitate collaboration between students and provide the proper instruction in the digital business development process. It is not only about the content in entrepreneurship education, it is necessary to pay attention to the importance of guidance during the learning process and define the role of teachers in providing assistance by considering the level of student proficiency [40].

5.3 Curriculum

[52] stated that there are three pillars of the business incubation model, namely entrepreneurship, creativity and innovation. In addition, other literature mentions that the content of business inclusion, especially digital business, at least requires skills that must be developed, including innovation, leadership and management [57]. Entrepreneurship education should focus on personal development and commitment to social impact [36]. In this case, [39] divides entrepreneurship education competencies into two, they are technical competencies and key competencies. Technical competence relates to professional expertise and key competencies for lifetime learning, occupation, social inclusion and individual fulfilment. Creativity and innovation are not formed by themselves, but require shaping and creating. Therefore, there is a need to highlighting the value of the transfer of technology, the tutorship program, innovation and creativity through entrepreneurship and academics [53]. Therefore, there is need to emphasize the value of technology transfer, mentorship programs, innovation and creativity through entrepreneurship and academics. The project-based learning approach is essential to provide students with real-world experience in developing sustainable digital solutions. The curriculum needs be designed in such a way that students learn from real cases, develop prototypes, and test their business ideas in a realistic context. Based on the literatures, the core of curriculum content focuses on personal self-development and technical skill development. Personal development such as building a good business mindset, creativity, leadership skills and social impact orientation. Technical skills are supported by management skills, the use of technology and relevant technical assistance programs.

5.4 Methods

The existing literature validates the integration of ideas of fairness and equity, constructivism, humour and role play as the principles of learning and elements of delivery in entrepreneurial pedagogy to improve learning outcome satisfaction [41]. Learning methods in this program should encourage active and collaborative learning. The use of digital technology should be integrated in the educational process to facilitate the

elaboration of ideas and prototypes. In addition, learning methods should focus on collaboration between students, lecturers and industry to create innovative and sustainable solutions. Project-based learning (PBL) is one of the effective methods in this context, as it allows students to work on real projects that are relevant to market and environmental needs.

5.5 Assessment

Quality score measurements are conducted on the display of informative sustainability content [32]. Similarly, the study stated that value-based measures can be embedded into university sustainability outcomes assessment [33]. Assessment in the sustainable digital business incubation program should include business project evaluation, presentation, sustainability report, and practical skills. This assessment should be continuously conducted to ensure that students are not only developing innovative businesses but also socially and environmentally responsible businesses. Performance indicators need to include the economic, social, and environmental implications of the business developed by the students.

5.6 Output

The positive impact of entrepreneurship education is stimulating start-up intentions in interdisciplinary students in higher education [42]. Emerging entrepreneurs have improved access to the infrastructure and resources required for entrepreneurial success through business incubation, thereby increasing their real chances (capabilities) of success [55]. Incubation and open innovation can contribute significantly to the development of digital startups [56]. The output of the program is able to create innovative and sustainable digital businesses as well as students who have practical skills in digital entrepreneurship and a strong awareness of sustainability. The generated startups are expected to be able to operate sustainably and make a positive contribution to society and the environment. In addition, students who graduated from this programme will have the skills needed to lead and manage responsible digital businesses.

6 Conclusion

The implementation of a sustainable university needs to involve students as policy centres, students are not limited to being policy receptors. In this case, the University should initiate the implementation of a sustainability programme. Based on the literature, universities are still dependent on institutional pressures, however, this does not guarantee that the university will be able to perform. One of the sustainable programmes that can be implemented by universities is through digital business incubation for students. The existence of digital business incubation is expected to prepare students to enter the entrepreneurial field.

By integrating these aspects in the digital business incubation ecosystem, sustainable universities can create a favourable environment for innovative and responsible business development. Comprehensive programmes, competent tutors, interdisciplinary curriculum, collaborative learning methods, continuous assessment, and quality outputs are key elements in creating an ecosystem that supports university sustainability. The emphasis of the digital business incubation curriculum can focus on personal development and technical skills.

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