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Tese de doutorado

PROPOSTA DE MODELO TEÓRICO E DIRETRIZES PARA INCUBADORAS DE EMPRESAS UNIVERSITÁRIAS ORIENTADAS PARA A SUSTENTABILIDADE

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Proposta de modelo teórico e diretrizes para incubadoras de empresas universitárias orientadas para a sustentabilidade

Bárbara Maria Fritzen Gomes

Tese de Doutorado apresentada ao Programa de Pós-Graduação em Engenharia Civil e Ambiental da Universidade de Passo Fundo, como parte dos requisitos para obtenção do título de Doutor em Engenharia.

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RESUMO

A sustentabilidade vem sendo a protagonista do desenvolvimento global, no mínimo até o ano de 2030, limite estabelecido para que o desenvolvimento sustentável pautado em objetivos e metas esteja trilhando um caminho sólido, progressista e próspero. As universidades são reconhecidas como agentes primordiais na consecução das metas de sustentabilidade e podem potencializar sua atuação por meio do alinhamento de suas unidades intermediárias de inovação, especialmente as incubadoras de empresas, à Agenda 2030 e seus objetivos, bem como princípios de ESG (ambiental, social e de governança), buscando fomentar negócios tecnológicos que não apenas observem as premissas de um modelo de negócios escalável e replicável, mas que contemplem aspectos voltados à promoção de impactos socioambientais e econômicos positivos. O empreendedorismo e a inovação sustentável são vistos como movimentos essenciais para o desenvolvimento sustentável. À luz deste cenário atual, corroborado pelas mudanças causadas pela pandemia da Covid-19, os modelos para as incubadoras de empresas vinculadas a universidades necessitam ser repensados, inserindo a sustentabilidade e resiliência como um pano de fundo de suas ações e ativos. O conhecimento ainda é limitado neste contexto, apontando uma necessidade de capturar e refletir sobre as melhores práticas para incubadoras orientadas à sustentabilidade. Neste sentido, o objetivo deste estudo é o desenvolvimento de um modelo teórico e diretrizes para incubadoras de negócios vinculadas à universidade orientadas para a sustentabilidade (SOBI). O processo metodológico consiste em três etapas: exploratória e descritiva, de desenvolvimento e de validação. A primeira permitiu explorar e descrever os atuais cenários global e brasileiro das incubadoras orientadas para a sustentabilidade. Nesta etapa foi realizada uma pesquisa qualitativa com incubadoras aos níveis nacional e internacional, bem como uma pesquisa exploratória internacional, a fim de aprofundar o conhecimento prático relativamente às tônicas de incubadoras de negócios orientadas para a sustentabilidade. Na etapa seguinte, foi realizado o desenvolvimento do modelo teórico e das diretrizes práticas, para, na terceira etapa, realizar a validação destes através de uma avaliação dos stakeholders de uma incubadora de empresas vinculada a uma universidade brasileira, permitindo a identificação de ajustes e revisões necessárias para proposição de um modelo teórico adequado para incubadoras universitárias orientadas para a sustentabilidade, bem como um playbook para este direcionamento. Os resultados demonstram que o redirecionar as incubadoras de empresas para a sustentabilidade é uma oportunidade para as universidades.

Palavras-chave: Incubadoras; universidade; sustentabilidade; Agenda 2030; ESG.

ABSTRACT

Sustainability has been the protagonist of global development, at least until 2030, the limit established for sustainable development based on goals and targets to be on a solid, progressive, and prosperous path. Universities are already recognized as prevalent agents in achieving these sustainability goals. They can enhance performance by aligning their intermediary innovation units, especially business incubators, to the 2030 Agenda and the ESG principles (environmental, social, and governance). Innovation environments seek to foster technological businesses, observing the premises of a scalable and replicable business model and promoting positive socio-environmental and economic impacts. Entrepreneurship and innovation are inevitable movements for sustainable development. In light of this current scenario, corroborated by the changes caused by the Covid-19 pandemic, the models for business incubators linked to universities need to be rethought, inserting sustainability and resilience as a backdrop to their actions and assets. Knowledge is still limited in this context, pointing to a need to capture and reflect on best practices for sustainability-oriented incubators. Therefore, this study aims at the ideation of a sustainability-oriented university-linked business incubator (SOBI) model. The methodological process consists of three stages: exploratory and descriptive data collection, development, and validation. Data collection enabled the exploration and description of current global and Brazilian sustainability-oriented incubators scenarios. In this stage, qualitative and quantitative research was conducted with incubators at the national and international levels to deepen practical knowledge concerning the keynotes of business incubators oriented towards sustainability. The development of the theoretical model and guidelines was carried out in the second stage. In the last stage, model and the guidelines' validation was performed through an evaluation of a business incubator linked to Brazilian university stakeholders, allowing the identification of adjustments and revisions necessary for the proposition of the theoretical model for university incubators oriented towards sustainability as well as a playbook for this direction. The results show reorienting business incubators toward sustainability may be a fish to fry for universities.

Keywords: Incubators; university; sustainability; Agenda 2030; ESG.

SUMÁRIO

LISTA DE ACRÔNIMOS

ACATE	Associação Catarinense de Tecnologia
ANPROTEC	Associação Nacional de Entidades Promotoras de Empreendimentos Inovadores
BNDES	Banco Nacional de Desenvolvimento Econômico e Social
CERNE	Centro de Referência para Apoio a Novos Empreendimentos
CriaLab	Laboratório de Criatividade da Tecnopuc
DFA	Design Factory Aveiro
ESD	Education for Sustainable Development
EDS	Educação para o Desenvolvimento Sustentável
ESG	Environmental, Social, and Governance
FABLab	Laboratório de criatividade e prototipagem do Tecnopuc
ICE	Instituto de Cidadania Empresarial
ICT	Information and Communication Technologies
IES	Instituições de Ensino Superior
IoT	Internet of Things – internet das coisas
IPCC	Painel Intergovernamental sobre Mudanças Climáticas
IPO	Initial Public Offering
LUC	Laboratório de Uso Comum do PCI
MVP	Minimum Viable Product
ODS	Objetivos do Desenvolvimento Sustentável
ONU	Organização das Nações Unidas
PCI	Parque de Ciência e Tecnologia da região de Aveiro
P&D	Pesquisa e desenvolvimento
PUC	Pontifícia Universidade Católica
SEBRAE	Serviço Brasileiro de Apoio às Micro e Pequenas Empresas
SOBI	Sustainability-oriented Business Incubator
SSCM	Gestão Sustentável da Cadeia de Suprimentos
TICE	Tecnologia da Informação, Comunicação e Eletrônica
TIC	Tecnologia da Informação e Comunicação
UFRGS	Universidade Federal do Rio Grande do Sul
UNISINOS	Universidade do Vale do Rio dos Sinos
UsaLab	Laboratório de Engenharia de Usabilidade de Produtos para a Saúde do Tecnopuc

LISTA DE FIGURAS

LISTA DE QUADROS

1. INTRODUÇÃO

1.1.CONTEXTUALIZAÇÃO E PROBLEMÁTICA DA PESQUISA

Transformações socioeconômicas, ambientais, tecnológicas e culturais vêm ocorrendo em todos os níveis, cada vez mais rápidas e acompanhadas por intensa crise de valores para alcançar uma visão de futuro capaz de enfrentar os desafios que se colocam neste ritmo acelerado (PROGRAMA CIDADES SUSTENTÁVEIS, 2016). O desenvolvimento econômico é cada vez mais intensificado através de diversas ações antrópicas, tais como: industrialização globalizada, explosão demográfica, desenvolvimento de novos produtos, elevada produção e consumo excessivo. Contudo as questões ambientais e sociais são negligenciadas (SEVERO et al., 2016).

O sistema econômico em que vivemos produziu extraordinários benefícios para a humanidade, como riqueza e bens de consumo, cultura, conhecimento, avanço tecnológico e um aumento formidável no bem-estar e na expectativa de vida. Contudo, não foi capaz de lidar com externalidades negativas, como desigualdade de oportunidades, injustiça social e prejuízos sem precedentes ao meio ambiente (ICE, 2019). Uma das questões mais desafiantes é como equilibrar o desenvolvimento econômico com a sustentabilidade ambiental e a justiça social, questão complexa que deve ser enfrentada de forma sistêmica e horizontal, conduzindo ao chamado desenvolvimento sustentável (PROGRAMA CIDADES SUSTENTÁVEIS, 2016).

Ao longo das últimas décadas, tanto a comunidade científica e as instituições governamentais, quanto às gerações engajadas e preocupadas com o bem-estar das gerações futuras, vêm discutindo a temática de sustentabilidade. O interesse da comunidade acadêmica e empresarial cresceu exponencialmente após a Organização das Nações Unidas (ONU) estabelecer os 17 Objetivos do Desenvolvimento Sustentável (ODS) e os 193 países membros ratificarem a Agenda 2030 em 2015 (MOLDAVSKA; WELO, 2019), a qual representa um instrumento ambicioso e sem precedentes de consenso global que clama a participação da quíntupla hélice para juntos enfrentar os desafios econômicos, sociais e ambientais globais enfrentados (APOSTOLOPOULOS et al., 2018; UNDP, 2017; APOSTOLOPOULOS; LIARGOVAS, 2018; CARAYANNIS; CAMPBELL, 2010).

A contribuição e inovação do setor privado, tanto de países desenvolvidos quanto em desenvolvimento, é um impulsionador transformacional e um pré-requisito para alcançar as 169 ambiciosas metas que compõem coletivamente os 17 ODS da Agenda 2030, ao mesmo tempo em que estimula o crescimento econômico liderados pelos princípios do desenvolvimento

sustentável (APOSTOLOPOULOS et al., 2018; UNDP, 2017). Neste contexto, o setor privado, na figura das empresas, é um parceiro indispensável e tem um papel crítico como uma alavanca de implementação. A difusão dos princípios universais é primordial, uma vez que contribui com a sua capacidade de inovar e desenvolver soluções sustentáveis, inclusivas e economicamente viáveis a favor da sociedade (UNDP, 2017; FTFS, 2015).

A exigência de um comportamento empresarial responsável é uma necessidade global, dados os finitos recursos planetários, as tendências da globalização e o crescimento econômico contínuo, o qual está cada vez mais dependente de um engajamento dos negócios, uma vez este provê bens e serviços, financiamentos sociais e investimentos econômicos através de taxas e cria soluções inovadoras para ajudar a atacar desafios de desenvolvimento, atingindo mais de um ODS (APOSTOLOPOULOS et al., 2018; UNDP, 2014). Este fato se intensificou após os impactos causados pela pandemia da COVID-19, demonstrando que o desenvolvimento de inovações e o engajamento do setor privado tem potencial para estimular ações de recuperação pós-pandemia com um viés de resiliência e sustentabilidade, solucionando desafios sociais, ambientais e econômicos (UN, 2020). Nada obstante, estes desafios constituem oportunidades interessantes, especialmente para startups, para estabelecer negócios apropriados que criam valor para a sociedade (KUCKERTZ et al., 2020).

Diante desta conjuntura, o setor privado é clamado a empreender, investir e inovar não apenas observando o risco e retorno, sendo fundamental adicionar nova camada – a do impacto –, ou seja, levar em consideração, além dos fatores econômicos, os impactos sociais e ambientais de determinada atividade, expandindo os efeitos positivos enquanto se reduz os negativos e atuando como agentes de mudança, adotando a métrica ESG para garantir investimentos financeiros em seus negócios (ICE, 2019). O tema de negócios inclusivos que observam e preconizam a geração de impactos socioambientais positivos tem se tornado cada vez mais relevante dentro do cenário pós-pandemia do contexto da Agenda 2030, localização dos ODS no mundo e difusão do ESG globalmente (FTFS, 2015; UN 2020).

Observa-se em diversas partes do mundo o surgimento de novos formatos organizacionais híbridos, que buscam atingir dois objetivos antes vistos como incompatíveis: sustentabilidade financeira e geração de valor socioambiental. Os negócios de impacto, empreendimentos com a missão de gerar impactos socioambientais positivos e que permitem trazer retorno financeiro aos investidores, com modelos economicamente sustentáveis, surgem como uma nova força de transformação no mundo, ampliando o capital investido na busca de respostas inovadoras para questões urgentes, demonstrando que estes negócios podem lidar

com muitos desafios a níveis global e local (BARBOSA; SETUBAL, 2017; APOSTOLOPOULOS et al., 2018).

Startups, como parte da quíntupla hélice através do setor privado, apresentam potencial para o desenvolvimento de soluções inovadoras, entretanto necessitam de um ecossistema de apoio para o desenvolvimento de modelos de negócios, atração de investidores e mentoria. As incubadoras de empresas provem um ambiente adequado para abrigar estas empresas, oferecendo facilidades, apoiando serviços, conhecimento de mercado, conhecimento de tecnologias e seus aspectos legais, bem como acessos a fontes de recursos, objetivando alavancar os recursos existentes e fomentar a sinergia entre as empresas (STAL et al., 2016). Muitas incubadoras de empresa se relacionam com o ambiente universitário, estando localizadas em universidades, fortalecendo relacionamentos com a academia, ciência, pesquisa e tecnologia, visto que as universidades são tidas como um dos principais atores na criação e dispersão de conhecimento interdisciplinar (HAYTER, 2016).

As universidades, através do reconhecimento de sua terceira missão – inovação, fazem parte de um sistema híbrido juntamente com o governo, sociedade civil e as empresas no processo de inovação, uma rede quadrilateral que envolve colaborações e interações entre a própria universidade e parceiros não acadêmicos, gerando a capitalização do conhecimento (STAL et al., 2016). As universidades e empresas são parceiros naturais e preferenciais em países em desenvolvimento, onde as empresas buscam fontes externas de conhecimento para complementar seus recursos humanos e laboratórios de pesquisa e desenvolvimento, visto que os resultados de negócios novos são incertos (CHESBROUGH, 2006; STAL et al., 2016).

É de conhecimento o papel das universidades como agentes de mudança no desenvolvimento econômico, porém tal contexto tem conduzido a uma reflexão sobre as possibilidades que universidades teriam para contribuir com o fortalecimento político e econômico das comunidades em que estão inseridas, também em uma perspectiva de desenvolvimento sustentável, não apenas em suas operações, mas principalmente no campo da pesquisa, do ensino e da inovação (LEAL FILHO, 2011; WAKKEE et al., 2017; LEAL FILHO et al., 2017). As incubadoras universitárias geralmente estão focadas na promoção da inovação tecnológica, incorporando um papel intrinsecamente social, na medida em que catalisam negócios sustentados com produtos inovadores, de alto valor agregado, gerando emprego e renda. Entretanto, em uma análise sobre o viés do desenvolvimento sustentável, nota-se que não é o suficiente, pois se percebe a ausência do estimulo à reflexão sobre a importância das dimensões social e ambiental no contexto das startups (CARDOSO et al., 2008).

As incubadoras de empresas universitárias, por representarem um importante e fundamental papel no amadurecimento e fomento de startups, não podem ir à contramão do desenvolvimento sustentável (LIN-LIAN et al., 2021). Como parte da terceira missão das universidades, estes ambientes de inovação podem se tornar catalisadoras do desenvolvimento sustentável, não apenas por auxiliarem as empresas a se tornar organizações autossustentáveis do ponto de vista econômico, mas também pela sua capacidade de induzir tais negócios a se conformarem socioambientalmente (CARDOSO et al., 2008). O desenvolvimento sustentável é uma dimensão importante para incubadoras de empresas melhorar os negócios de seus incubados, devendo estas atuar de forma proativa e estar comprometidas a promover a fomentar práticas socioambientais baseadas na inovação, utilizando processos sistematizados que viabilizam a ampliação tanto da quantidade quanto da qualidade dos empreendimentos gerados (HERNÁNDEZ; CARRÀ, 2016; ANPROTEC, 2018).

Para tanto, a principal questão de investigação a ser respondida nesta tese é: **como as incubadoras de empresas universitárias podem orientar para a sustentabilidade e geração de impacto socioambiental as facilidades e serviços ofertados a suas startups?**

Atualmente, tem surgido uma atenção em pesquisas e práticas para incubadoras se estruturarem e apoiarem o desenvolvimento sustentável através de suas startups (BANK et al., 2017). Lose et al. (2020) apontam que, diante de um novo cenário causado pela pandemia do coronavírus, as incubadoras de negócios precisam remodelar seus entregáveis de incubação, seus processos de incubação e seus modelos conceituais para promover a sobrevivência de suas startups na era pós-Covid, bem como a agregação de valor dos negócios incubados.

Os modelos teóricos de incubadoras de empresas são amplamente conhecidos dentro do cenário científico-acadêmico. Contudo, apesar da popularidade das incubadoras de empresas na literatura e na prática, poucos estudos se concentram em incubadoras de impacto socioambiental ou, mais especificamente, modelos teóricos para incubadoras orientadas para a sustentabilidade (BANK et al., 2017; FONSECA; JABBOUR, 2012), tampouco considerando um cenário pós pandêmico.

O conhecimento limitado nestas áreas aponta para uma clara lacuna de conhecimento científico (BANK et al., 2017). No entanto, a inter-relação destas áreas de pesquisa continua latente e há uma necessidade de capturar e refletir sobre as melhores práticas (APOSTOLOPOULOS et al., 2018), demonstrando a necessidade da concepção de um modelo teórico que servirá como suporte norteador para incubadoras de empresas vinculadas a universidades a orientar-se para a sustentabilidade e a geração de impactos socioambientais.

Diante do exposto, considera-se que esta pesquisa confere contribuição para o avanço do campo de conhecimento em desenvolvimento sustentável e a agenda global, tema de extrema relevância que irá nortear estratégias até 2030. Corroborando a isso, a linha de pesquisa Planejamento Territorial e Gestão da Infraestrutura do Programa de Pós-graduação em Engenharia Civil e Ambiental está amplamente comprometida no desenvolvimento de pesquisas relacionadas ao papel da universidade para o desenvolvimento sustentável. Contudo, ainda no campo teórico, estudos voltados à inovação sustentável e seus mecanismos de promoção ainda são relativamente novos nesta linha de pesquisa. Sendo assim, esta tese contribui para a expansão de estudos que possibilitem o avanço nesta área. Fica elucidado o potencial de informações a ser explorado na temática proposta e a sua justificativa teórico-prática para o objeto de estudo.

1.2.OBJETIVOS

1.2.1 Objetivo geral

Desenvolver um modelo teórico e diretrizes para incubadoras de empresas universitárias orientadas para a sustentabilidade (SOBI).

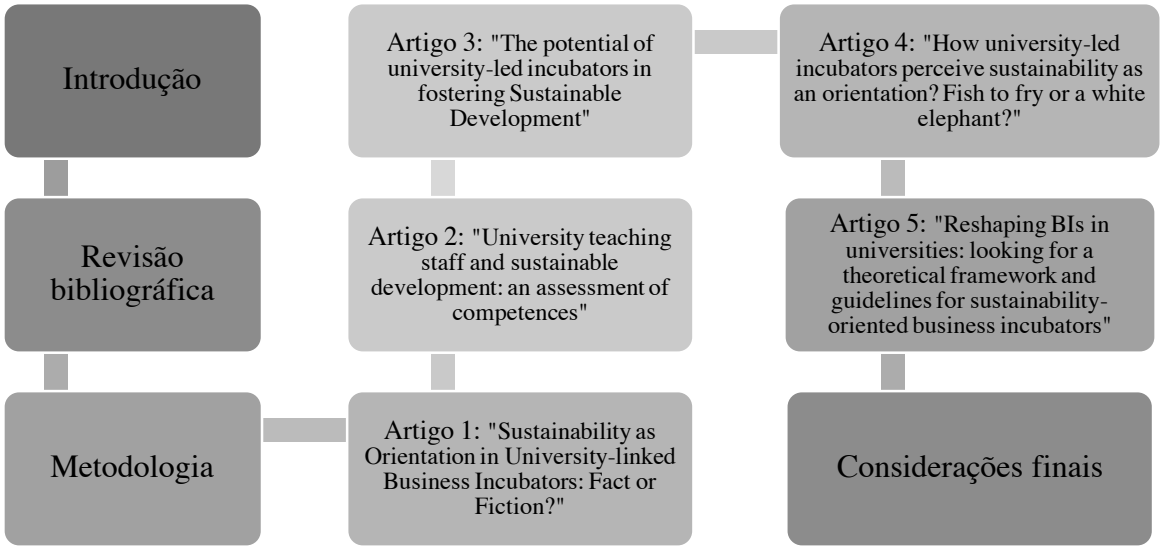
1.2.2 Objetivos específicos

a) Identificar incubadoras de empresas vinculadas a universidades aos níveis nacional e internacional e classificá-las conforme seu foco de impacto;
b) Aprofundar o conhecimento teórico e prático e a compreensão sobre incubadoras de empresas universitárias, estudando abordagens que possam contribuir para orientação de seus serviços e facilidades à promoção da sustentabilidade e geração de impacto;
c) Desenvolver um modelo teórico para incubadoras de empresas vinculadas a universidades orientadas para a sustentabilidade;
d) Elaborar diretrizes para que incubadoras universitárias orientarem seus ativos para a sustentabilidade;
e) Validar o modelo proposto e as diretrizes em uma incubadora de empresas vinculada a uma universidade brasileira.

1.3. APRESENTAÇÃO DA TESE

Esta tese é apresentada em capítulos que contemplam além da introdução, revisão bibliográfica e metodologia, quatro artigos elaborados para submissão em a periódicos científicos de elevado fator de impacto afim de promover o amplo conhecimento do assunto na área da engenharia e gestão ambiental. A Figura 1 demonstra a trilha de estruturação e apresentação da tese.

Figura 1- Trilha de estruturação da tese.



Fonte: O autor (2022).

A introdução contextualiza a temática da sustentabilidade, o papel da inovação para o desenvolvimento sustentável e resiliente, especialmente em uma fase pós-pandemia e como as incubadoras de empresa vinculadas às universidades podem ser catalisadoras de negócios e inovações responsáveis e de impacto.

A revisão bibliográfica aborda temáticas consideradas cruciais para a fundamentação teórica do trabalho e também para o embasamento da aplicação metodológica. Inicialmente, apresenta-se uma abordagem da quíntupla hélice de inovação, a qual congrega os princípios de sustentabilidade e sociedade a tríplice hélice. Na sequência, trata-se do conceito e do histórico do desenvolvimento sustentável.

Posteriormente dá-se enfoque para o conceito de empreendedorismo sustentável, discorrendo sobre o papel das inovações tecnológicas e das *startups*. Dentro do contexto de empreendedorismo orientado para a sustentabilidade, apresentam-se algumas de suas diretrizes,

dentre estas: Agenda 2030 e seus Objetivos do Desenvolvimento Sustentável, a abordagem ESG – Environment, Social, and Governance e Negócios de Impacto.

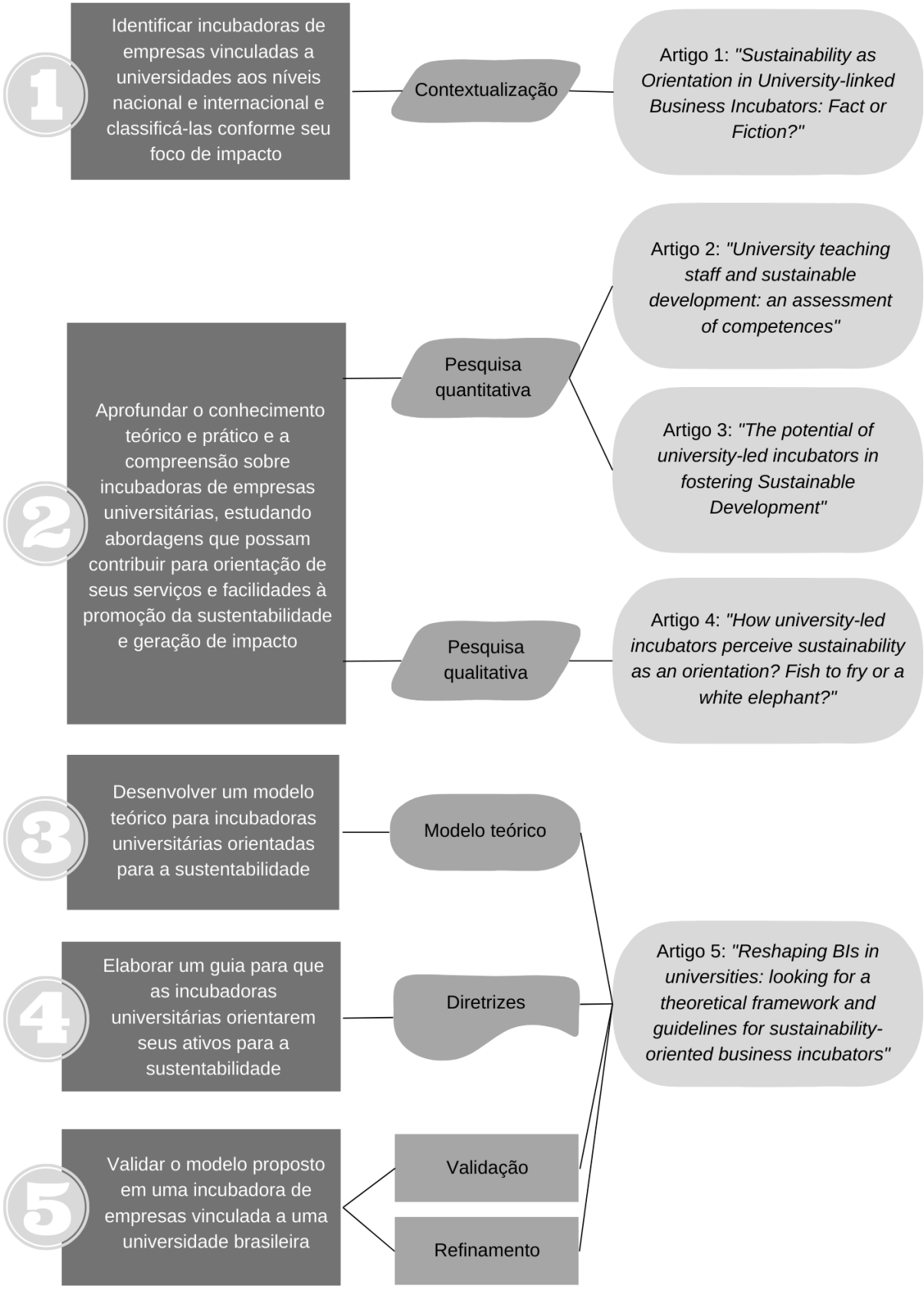
O papel da inovação sustentável é discorrido, apresentando as incubadoras de empresas como ambientes de inovação capazes de promover tecnologias e negócios orientados para a sustentabilidade através da remodelagem de seus modelos e serviços. Incubadoras universitárias que apresentam a educação como pilar básico e o fomento a inovações tecnológicas como vocações são conceitualizadas sob o viés de como podem contribuir para a sustentabilidade, discutindo a cerca das novas configurações que as incubadoras vem tomando para inserção e promoção deste temática. Ao final deste capítulo uma figura-conceito da tese é apresentada.

O capítulo de metodologia apresenta a área de estudo, a classificação da pesquisa, bem como o processo metodológico, descrevendo as etapas da metodologia, tais como: fase exploratória, fase de desenvolvimento e fase de validação, através de um fluxograma geral das etapas de desenvolvimento da tese.

Os resultados da tese estão apresentados através de cinco artigos científicos que representam os objetivos específicos da tese, os quais são apresentados ordenadamente, conforme apresenta a Figura 2. O artigo 01 intitulado "*Sustainability as Orientation in University-linked Business Incubators: Fact or Fiction?*" aborda o cenário mundial e brasileiro das incubadoras vinculadas a universidades no que tange seu foco na sustentabilidade. Considerando que a educação é uma das bases para o desenvolvimento sustentável, o artigo 02 "*University teaching staff and sustainable development: an assessment of competences*" explora as competências requeridas para fomentar a transformação educacional voltada para a sustentabilidade. O artigo 03 intitulado "*The potential of university-led incubators in fostering Sustainable Development*" apresenta uma pesquisa quantitativa exploratória internacional sobre o potencial de incubadoras vinculadas a universidade em promover desenvolvimento sustentável, identificando os principais desafios e impulsionadores. O artigo 04 "*How university-led incubators perceive sustainability as an orientation? Fish to fry or a white elephant?*" apresenta uma pesquisa exploratória qualitativa de quatro incubadoras vinculadas a universidades localizadas no Brasil, Portugal e Alemanha, apontando as principais perspectivas dessas instituições com relação à inovação e ao empreendedorismo sustentável. Por fim, o artigo 05 "*Reshaping BIs in universities: looking for a theoretical framework and guidelines for sustainability-oriented business incubators*" apresenta o modelo desenvolvido para incubadoras orientadas à sustentabilidade, validado por uma SOBI brasileira e reconhecida nacionalmente.

Na sequência da apresentação dos cinco artigos científicos desenvolvidos a partir dos resultados da tese, os resultados da etapa denominada “Pesquisa exploratória” serão apresentados, uma vez que esta não corresponde diretamente a nenhum artigo científico da tese. Neste item serão descritos os resultados descritos através do *benchmarking* realizado na HAW Hamburg através do doutoramento sanduíche da pesquisadora, o qual propiciou conhecimento teórico aprofundado sobre princípios de sustentabilidade e Educação para o Desenvolvimento Sustentável. Ao final, o estudo apresenta uma síntese das principais conclusões obtidas na tese.

Figura 2 - Objetivos específicos, etapas da metodologia e artigos desenvolvidos, respectivamente.



Fonte: O autor, 2021.

2. REVISÃO BIBLIOGRÁFICA

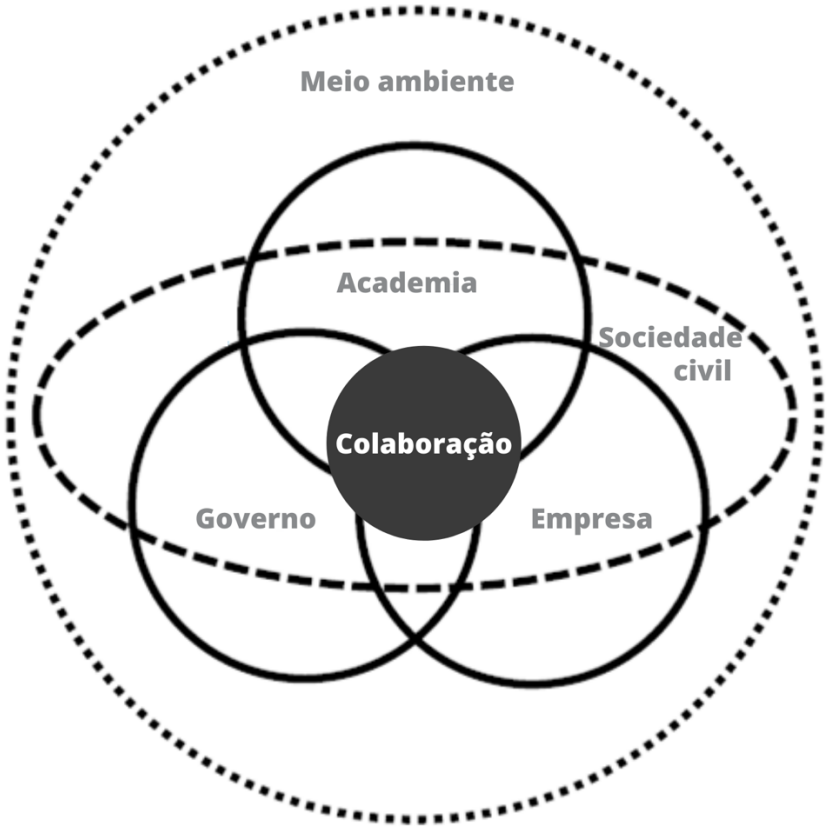
2.1 QUÍNTUPLA HÉLICE DA INOVAÇÃO

No início dos anos 2000, os pesquisadores Etzkowitz e Leydesdorff propuseram uma abordagem chamada de tríplice hélice da inovação, com a premissa de que o dinamismo dos ecossistemas de inovação depende da articulação de três atores: universidade/academia/instituições de ensino superior, iniciativa privada/empresas/negócios e o poder público/governo/Estado (ETZKOWITZ; LEYDESDORFF, 2000). Dentro do conceito de inovação trazido por Schumpeter (1985), o modelo de cooperação entre estes três atores dentro do ecossistema de inovação permite a geração, difusão, utilização e comercialização do conhecimento e da inovação (WU et al., 2015).

Carayannis e Campbell (2010) entendem que o conceito de tríplice hélice descreve os processos básicos de conhecimento da economia e inovação, desta forma, expandiram e complementaram esta abordagem trazendo um quarto ator para dentro do contexto, a sociedade civil, considerando que a democracia transforma as condições de inovação e que a sociedade é um ator transformacional para a inovação. Este modelo é conhecido como quádrupla hélice.

Seguindo as tendências de abordagens globais, Carayannis e Campbell (2010) incorporam à quadruple hélice as dimensões socioambientais e a necessidade de considerar aspectos de meio ambiente no contexto da sociedade e da economia, a chamada quíntupla hélice. Esta compreensão garante que políticas, práticas e iniciativas sejam inteligentes, sustentáveis e inclusivas impactando positivamente do ponto de vista social, ambiental e financeiro. Sem esta integração, a compreensão da inovação é limitada e insuficiente para compreender os desafios associados. A quíntupla hélice enfatiza a necessidade de uma transição socioambiental da sociedade e da economia do século 21, dimensões que devem ser vistas como impulsionadores de produção de conhecimento e inovação, criando sinergia entre economia, sociedade e democracia. A Figura 3 demonstra a figura-conceito do modelo de quíntupla hélice da inovação.

Figura 3 - Figura-conceito da quíntupla hélice.



Fonte: Elaborado pela autora com base em Carayannis e Campbell (2010)

Carayannis e Campbell (2010) destacam que, através da compreensão da quíntupla hélice, o desenvolvimento sustentável deve ser trazido para o contexto do ecossistema de inovação, através da inovação sustentável e do empreendedorismo sustentável. Cada uma das cinco hélices tem um ativo primordial para a promoção da sustentabilidade. A hélice da academia, através da quinta geração de universidades, é a provedora de ambientes de inovação para o fomento do empreendedorismo inovador e sustentável, ou seja, as incubadoras de empresas vinculadas às universidades.

2.2 SUSTENTABILIDADE

O capitalismo da mais valia, conforme o qual quanto mais se ganha melhor, não é sustentável no longo prazo, visto que os recursos naturais estão cada vez mais escassos e a pobreza endêmica compromete o progresso das nações (BOMBARDI et al., 2018). Está consensuado mundialmente que o atual modelo de desenvolvimento adotado vem causando uma sistemática destruição dos recursos do planeta, colocando em risco, inclusive, a continuidade da própria espécie humana (PROGRAMA CIDADES SUSTENTÁVEIS, 2016). Não obstante, a humanidade entrevê esta crise social e ambiental desde a segunda metade o

século XX, sendo que o delineamento do conceito de sustentabilidade iniciou durante a Conferência das Nações Unidas sobre o Meio Ambiente Humano (UNCHE) realizada em Estocolmo em 1972 (BARBOSA, 2008).

No início da década de 80, o termo "desenvolvimento sustentável" emergiu na Carta Mundial à Natureza, na Assembleia Geral da ONU. Contudo, o conceito pautava-se apenas na priorização das dimensões ambiental e ecológica, o que o definia como um modelo de um único pilar (PAOLI; ADDEO, 2019). Ao final desta década, o Relatório Brundtland – Nosso Futuro Comum consagrou-se como um marco de definição dos conceitos de sustentabilidade e desenvolvimento sustentável, trazendo a ideia formal de que ele deve satisfazer as necessidades presentes sem comprometer as gerações futuras, considerando os eixos econômico, social e ambiental, através da perspectiva de que o desenvolvimento econômico deve considerar o equilíbrio ecológico e a preservação da qualidade de vida das populações humanas a nível global (WCED, 1987; SIKDAR, 2004). A ideia de desenvolvimento sustentável tem por base o princípio de que o Homem deve consumir os recursos naturais de acordo com a capacidade de renovação desses recursos, de modo a evitar o seu esgotamento (SIKDAR, 2004).

Apesar de ser um conceito questionável por não definir quais são as necessidades do presente nem quais serão as do futuro, o Relatório de Brundtland chamou a atenção do mundo sobre a necessidade de se encontrar novas formas de desenvolvimento econômico, sem a redução dos recursos naturais e sem danos ao meio ambiente (BARBOSA, 2008). Desde então, a sustentabilidade é uma temática que vem sendo cada vez mais discutida (PAOLI; ADDEO, 2019), sendo que diversos estudos passaram a discutir definições e a abordagem de sustentabilidade nos mais variados contextos, contribuindo para o rápido aumento da consciência sobre a sua importância e implementação em todo o mundo (FEIL; SCHREIBER, 2017; OLAWUMI; CHAN, 2018; SINAKOU et al., 2018). Além do interesse científico, ao longo dos anos, diversos eventos e convenções globais e setoriais abordaram discussões sobre acordos internacionais sobre o desenvolvimento sustentável e a sustentabilidade (BEURON, 2016), sendo visto como o principio orientador para o desenvolvimento global de longo prazo (UN CSD, 2012). A Figura 4 demonstra a uma síntese dos eventos e convenções mundiais que abordaram a temática do desenvolvimento sustável.

Figura 4 - Principais eventos e convenções sobre o desenvolvimento sustentável.

Fonte: Elaborado pelo autor, baseado em Beuron (2016); Gavard (2009); Nascimento (2012); INBS (200?); MALHEIROS et al., 2008; MMA (200?); ONU (2000); PAOLI; ADDEO (2019); UN (2020).

O desenvolvimento sustentável pode ser considerado como uma tentativa de combinar preocupações crescentes sobre questões ambientais e sociais com questões socioeconômicas (PAOLI; ADDEO, 2019). A atividade econômica, o meio ambiente e o bem-estar global da sociedade formam o tripé básico, conhecido como "*Triple Bottom Line*" no qual se apoia a ideia de sustentabilidade, com processos econômicos, sociais e ambientais fortemente interligados, interdependentes e mutuamente sustentados (SIKDAR, 2004; UN CSD, 2012;

PAOLI; ADDEO, 2019). A Figura 5 representa o conceito de desenvolvimento sustentável representado em suas três principais dimensões.

Figura 5 - Pilares interdependentes do *Triple Bottom Line*.

Fonte: Adaptado de SIKDAR (2004).

A sustentabilidade só pode ser alcançada se estes três eixos evoluírem de forma harmoniosa, evidenciando que este conceito vai além da conservação ambiental, apelando para uma mudança estrutural a longo prazo na economia e no sistema social, reduzindo o consumo de recursos naturais, porém mantendo o potencial econômico e a coesão social (SIKDAR, 2004). O imperativo econômico convencional, centrado na maximização da produção econômica, deve ser restringido em favor dos imperativos sociais (minimização do sofrimento humano atual e futuro) e ecológicos (de proteção da ecosfera) (VAN BELLEN, 2003). Porém esta atenção cega aos objetivos ambientais pode prejudicar o desenvolvimento socioeconômico, o que coloca em xeque a noção de equilíbrio que o conceito de sustentabilidade propõe (GRIGGS et al., 2014; BRITO et al., 2014).

O conceito de sustentabilidade conota uma complexidade intrínseca, uma dificuldade de aplicação e compreensão justamente pela quantidade de variáveis que apresenta e as inúmeras inter-relações das mesmas. Além disso, o ser humano tem dificuldade de prever e de se antecipar a todas as eventuais demandas e problemas que poderão advir das suas ações, decisões e operações. Desta forma, muitas vezes, o termo sustentabilidade está presente somente nos discursos políticos, mas não permeia as ações governamentais (UN, 2014). Mesmo

sendo um conceito amplamente usado e discutido, o desenvolvimento ainda não é um conceito unívoco, havendo diversos significados e provocando diversas respostas e pontos de vista dentro da comunidade acadêmica, não havendo uma clareza e uma definição operacional compartilhada deste conceito. Assim, ao examinar uma interpretação do desenvolvimento sustentável, é importante considerar a filosofia subjacente ao ponto de vista do proponente, porque isso influencia o que são consideradas as principais prioridades e escolhas sobre quais políticas devem ser adotadas (PAOLI; ADDEO, 2019).

A sustentabilidade vem sendo pensado como um conceito global, uma vez que o mundo está entrando em uma nova era de governança global para o desenvolvimento e o meio ambiente, construído na confiança e em valores compartilhados, em objetivos, e menos em quadros juridicamente vinculativos, devendo envolver novos conceitos, novas instituições, novos modelos de prática, novas formas de cooperação e novos valores (GORE, 2015; STAFFORD-SMITH et al., 2016). Gradativamente, importantes conferências internacionais vêm ocorrendo, as quais tem discutido e definido as peças de um quadro de desenvolvimento global voltado para a erradicação da pobreza, detenção e reversão dos efeitos adversos das alterações climáticas e o preparo para o caminho para um futuro mais sustentável (UN-SDSN, 2016).

2.1.1 Agenda 2030 para o Desenvolvimento Sustentável e os ODS

Até o ano de 2015, o desenvolvimento internacional era norteado pelo pacto político, Agenda 2015, pautada em oito Objetivos de Desenvolvimento do Milênio (ODM), os quais se dedicavam a um movimento antipobreza e de cunho social, apresentando lacunas consideráveis para a promoção do desenvolvimento sustentável. Mesmo considerando seu notável sucesso em incentivar o consenso político global, esta agenda, ao término do seu prazo (2000-2015), foi substituída por um pacto que considerou ir além dos objetivos predominantemente sociais desta agenda, incorporando a sustentabilidade econômica e ambiental em um nível mais profundo e inserindo a aspiração para o alcance de sociedades pacíficas e inclusivas. Esta nova agenda foi constituída por uma visão compartilhada de desenvolvimento, com um escopo mais amplo, uma abordagem holística de uma ampla gama de temáticas, assegurando a sinergia por meio de novos e transformadores aspectos para o futuro do planeta (WAAGE et al., 2010; UNEP, 2013; UNDP, 2017; MARTINS et al., 2015; IPEA, 2014).

Em setembro de 2015, 193 Chefes de Estado e de Governo do mundo, ratificaram por unanimidade o documento “Transformando Nosso Mundo: A Agenda 2030 para o Desenvolvimento Sustentável” durante a Assembleia Geral das Nações Unidas, o qual tem um

retórico compromisso com o desenvolvimento sustentável, baseado em direitos equitativos e inclusivos, assegurando a prosperidade e o bem estar de todas as pessoas, enquanto protege o nosso planeta, através do comprometimento das partes interessadas em trabalhar em conjunto. A Agenda 2030 para o Desenvolvimento Sustentável é a primeira agenda universal e holística para o desenvolvimento global, a qual estabelece um conjunto de 17 Objetivos de Desenvolvimento Sustentável acompanhados de 169 metas globais aspiracionais, devendo ser alcançadas até 2030 para cobrir ambiciosamente as mais diversas e variadas temáticas em termos de pessoas, planeta, prosperidade, paz e parcerias (PNUD, 2014; UN-SDSN, 2016; UN, 2015; UN-SDSN, 2015; UCLG, 2016; UN, 2016; UNDG, 2016; ALLEN et al. 2016; UNDP, 2017).

De acordo com UNDP (2014), UN (2015), UNDG (2016) e UNDP (2017), a Agenda 2030 representa um consenso global sem precedentes, bem como é indivisível, integrada e aspiracional, sendo delineada para a comunidade global, a fim de transformar o mundo em um caminho mais sustentável e resiliente, sem deixar ninguém para trás, forçando uma equidade na busca de ações que alcancem os princípios diretores voltados para cinco eixos: pessoas, prosperidade, paz, parcerias e planeta (Figura 6).

Figura 6 - Eixos essenciais da Agenda 2030.

Fonte: PNUD (2016).

A amplitude e a profundidade desta agenda não têm precedentes, trazendo um conjunto integrado e indivisível de prioridades globais para o desenvolvimento sustentável, em uma transição de um crescimento econômico e uma abordagem baseada na renda para uma abordagem abrangente que inclua múltiplas dimensões que influenciam o progresso dos indivíduos (PNUD, 2014; UNDP, 2017).

Considerando tal cenário, é ainda mais importante o incentivo para a pesquisa sobre sustentabilidade, a fim de permitir a preservação do ambiente físico, a eficiência econômica e a equidade social, além de representar uma etapa da aliança do desenvolvimento sustentável com estruturas políticas existentes e auxiliar na busca pelos ODS (LEAL FILHO et al., 2017). De acordo com Leal Filho et al. (2017), os ODS representam uma oportunidade de incentivo à pesquisa de sustentabilidade, já que mesmo com muitos avanços, estes não impediram a humanidade de exceder seus limites e recursos naturais. Os autores reforçam a importância do caráter interdisciplinar e transdisciplinar da pesquisa de sustentabilidade, além do desenvolvimento da investigação sustentável em nível local, a fim de compreender adequadamente os impactos das decisões locais numa escala mais ampla.

Os ODS propostos pela Agenda 2030 foram construídos sobre as bases estabelecidas pelos ODMs, procurando completar o trabalho inacabado em relação a eles e responder a novos desafios, incorporando uma ampla variedade de tópicos inter-relacionados ao redor das dimensões econômica, social e ambiental do desenvolvimento sustentável (PNUD, 2015; UN, 2015; WBCSD, 2016; STAFFORD-SMITH et al., 2016; UNHABITAT, 2016; UN-SDSN, 2015; UN-SDSN, 2016).

Cada um dos 17 Objetivos do Desenvolvimento Sustentável (Quadro 1) são acompanhados por 169 metas, orientadas à ação, de natureza global e universalmente aplicáveis, com duplo propósito de aumentar o bem estar humano através do desenvolvimento, protegendo e fortalecendo os serviços ecossistêmicos que sustentam este bem estar (UNEP, 2013; UNDP, 2016).

Quadro 1 - Objetivos de Desenvolvimento Sustentável.

Objetivo	Descrição	Objetivo	Descrição
	Acabar com a pobreza em todas as suas formas, em todos os lugares		Reduzir a desigualdade dentro dos países e entre eles
	Acabar com a fome, alcançar a segurança alimentar e melhoria da nutrição e promover a agricultura sustentável		Tornar as cidades e os assentamentos humanos inclusivos, seguros, resilientes e sustentáveis

	Assegurar uma vida saudável e promover o bem-estar para todos, em todas as idades		Assegurar padrões de produção e de consumo sustentáveis
	Assegurar a educação inclusiva e equitativa de qualidade, e promover oportunidades de aprendizagem ao longo da vida para todos		Tomar medidas urgentes para combater a mudança climática e seus impactos
	Alcançar a igualdade de gênero e empoderar todas as mulheres e meninas		Conservação e uso sustentável dos oceanos, dos mares e dos recursos marinhos para o desenvolvimento sustentável
	Assegurar a disponibilidade e gestão sustentável da água e saneamento para todos		Proteger, recuperar e promover o uso sustentável dos ecossistemas terrestres, gerir de forma sustentável as florestas, combater a desertificação, deter e reverter a degradação da terra e deter a perda de biodiversidade
	Assegurar o acesso à energia confiável, sustentável, moderna e barata para todos		Promover sociedades pacíficas e inclusivas para o desenvolvimento sustentável, proporcionar o acesso à justiça para todos e construir instituições eficazes, responsáveis e inclusivas em todos os níveis
	Promover o crescimento econômico sustentado, inclusivo e sustentável, emprego pleno e produtivo e trabalho decente para todos		Fortalecer os meios de implementação e revitalizar a parceria global para o desenvolvimento sustentável
	Construir infraestruturas resilientes, promover a industrialização inclusiva e sustentável e fomentar a inovação		

Fonte: Elaborado pelo autor, baseado em PROGRAMA CIDADES SUSTENTÁVEIS (2016); UN (2016).

Os ODS foram desenvolvidos com contribuições dos negócios, academia e organizações não governamentais mundialmente e cobrem desafios nos campos da inclusão econômica, diminuição do consumo de recursos naturais, instabilidade geopolítica, degradação ambiental e impactos multifacetados das mudanças climáticas, definindo uma agenda para o crescimento econômico inclusivo até 2030 (EY, 2017). De acordo com UNDP (2017), ODS são baseados em três princípios:

a) Universalidade: objetivos e metas são relevantes para cada governo e para cada ator. Não significa uniformidade, mas sim diferenciação, aplicando o principio de responsabilidades comuns diferenciadas;
b) Integração: integração de políticas públicas significa balancear as dimensões do desenvolvimento social, crescimento econômico e proteção ambiental. Uma abordagem integrada implica em gerenciar as compensações e maximizar as sinergias entre os objetivos;
c) "Não deixar ninguém para trás": este principio considera que nenhum objetivo será alcançado a menos que todos atinjam. O progresso deve ser independente do nível de renda ou da presença de exclusão que muitas vezes está relacionada, mas nem sempre, a condição étnica e racial, orientação sexual e identidade de gênero, deficiência física ou mental, religião, nacionalidade, *status* de migração e outros elementos. Para erradicar a pobreza e romper o ciclo de desigualdade, os ODS devem beneficiar a todos. Este desafio estimula o uso de dados desagregados para entender os obstáculos sociais de cada cidadão.

Considerando que os ODS estão pautados no conceito de sustentabilidade, alguns autores propõe a agregação dos objetivos de acordo os pilares fundamentadores a temática. Paoli e Addeo (2019) observaram impactos diretos e os objetivos políticos dos ODS para classificar os ODS (Figura 7). Já Martins (2016), inseriu a dimensão institucional além das dimensões social (erradicação da pobreza; fome zero; saúde e bem estar; educação de qualidade; igualdade de gênero; redução das desigualdades), ambiental (água limpa e saneamento; energia acessível e limpa; consumo e produção responsáveis; combate às alterações climáticas; vida na água; vida terrestre) e econômica (trabalho decente e crescimento econômico; indústria, inovação e infraestrutura; cidades e comunidades sustentáveis) para compilar os ODS, conforme demonstra a Figura 8. Além de haver a dimensão institucional, que naturalmente envolve os ODS 16 – Paz, justiça e instituições eficazes e 17 – Parceiras e meios

de implementação, não há um consenso com relação à alguns objetivos, tais como: 2 – Fome zero e agricultura sustentável, 10 – Redução das desigualdades e 11 – Cidades e comunidades sustentáveis.

Figura 7 - ODS e as dimensões básicas do desenvolvimento sustentável.

Fonte: Adaptado de Paoli e Addeo (2019).

Figura 8 - ODS e as dimensões social, ambiental, econômica e institucional.

Fonte: Adaptado de Martins (2016).

Por sua vez, considerando os elementos essenciais da Agenda 2030 (5Ps), os ODS podem ser segregados em seus 5 eixos temáticos, demonstrando uma nova lógica de agrupamento, no que tange aspectos sociais (Pessoas), econômicos (Prosperidade) e ambientais (Planeta), aliados a Parcerias e Paz. A Figura 9 demonstra esta classificação proposta pela UNDP (2016).

Figura 9 - ODS e os elementos essenciais da Agenda 2030.

Fonte: Adaptado de UNDP (2016).

Apesar de os ODS estarem relacionados a uma dimensão em sua essência, o atendimento a um ODS pode refletir em melhorias de outro, significando que um ODS pode refletir em melhorias em mais de uma dimensão, devido as suas características de indivisibilidade e interrelações (MARTINS, 2016; PNUD, 2014). Desta forma, os ODS representam os maiores desafios e necessidades atualmente, requerendo ações coletivas através dos governos, sociedade civil, setor privado e comunidades e indivíduos dedicados, além da necessidade de unir os recursos necessários, capacidade inovativa e parceiros para conduzir a implementação de tais ações (UNDP, 2014).

O setor privado é parceiro indispensável e tem um papel crítico em prover soluções que podem contribuir para solucionar estes desafios e necessidades, além de gerar novas oportunidades, sendo que uma de suas diferenças nos meios de implementação com relação aos ODMs é o envolvimento deste ator, ao invés de doações, filantropias e financiamentos públicos (UNDP, 2014; GRI; UNGC, 2019; BOMBARDI et al., 2018). Nos países em desenvolvimento, as operações do setor privado constituem, em média, 60% do PIB, gerando 90% dos empregos e 80% das entradas de capital, contribuindo para o desenvolvimento através do fornecimento de bens e serviços, financiamento de investimentos sociais e econômicos por meio de impostos

e criação de soluções inovadoras para ajudar a enfrentar os desafios do desenvolvimento (UNDP, 2014).

Até pouco tempo, os investimentos do setor privado neste campo ainda eram considerados relativamente baixos. Apenas uma fração dos ativos de bancos, fundos perdidos, seguradoras, fundações e doações investidas globalmente estava relacionada ao desenvolvimento sustentável. Cenário ainda mais alarmante em países em desenvolvimento (UNDP, 2014). Nada obstante, investidores tem observado a importância dos ODS como uma forma de articulação dos assuntos ambientais, econômicos e sociais mais opressivos e podendo atuar como uma listagem definitiva de perspectivas sustentáveis (GIIN, 2016; GRI; UNGC 2019).

Prevê-se que os ODS gerem pelo menos 12 trilhões de dólares de oportunidades de mercado até 2030, podendo fomentar o empreendedorismo de uma forma sustentável. Ao identificar e mitigar riscos para as pessoas e o meio ambiente e ao fornecer novos produtos e serviços que apoiem o desenvolvimento sustentável, as empresas podem colher benefícios para si e para os mercados, demonstrando um forte argumento comercial para investir em oportunidades alinhadas com os ODS, inclusive ajudando os investidores a garantir retornos estáveis, representar melhor os valores de seus clientes e oferecer produtos financeiros sustentáveis que os diferenciam no mercado (UNDP, 2014; GRI; UNGC, 2016).

2.3 EMPREENDEDORISMO SUSTENTÁVEL

A existência de déficits sociais e ambientais no século XXI provoca as empresas enfrentarem desafios que limitam seu potencial de crescimento, tais como a escassez de recursos naturais, enfraquecimento de mercados financeiros, poder de compra limitado do mercado local e lacunas de talentos qualificados, não sendo capazes de se sustentar em um mundo de pobreza, desigualdade, agitação e estresse ambiental (PNUD, 2018; EY, 2017; GRI; UNGC, 2019). Este contexto motiva as empresas a interessarem na estabilidade e prosperidade das sociedades que operam (WBCSD, 2016).

O papel do empreendedorismo, como um veículo de transformação econômica e social, não é novo na literatura (DHAHRI; OMRI, 2018). Nos últimos 30 anos, a sociedade tem se questionado sobre o papel e responsabilidades das organizações em seu contexto (SILVA, 2021). Presumivelmente, os negócios que mantêm padrões e princípios éticos no que tange os reconhecimentos dos direitos humanos, trabalho, meio ambiente, combate à corrupção, arrecadação de imposto, geração de empregos e geração de renda, já fazem uma contribuição essencial para o desenvolvimento sustentável (GRI; UNGC, 2019; BOMBARDI et al., 2018).

2.3.1 Diretrizes para o empreendedorismo sustentável

A ONU considera que o setor privado, através das empresas em todos os seus níveis, é um parceiro vital para alcançar a sustentabilidade e enfrentar os desafios que a humanidade vem passando, sendo o papel do empreendedorismo neste contexto emergido como um tema importante de alguns debates nos últimos anos, destacando-se como agente fundamental para a Agenda 2030 (UN, 2016). Por sua vez, os Negócios de Impacto emergem como uma aspiração para um empreendedorismo que alie impacto socioambiental e sustentabilidade financeira (BOMBARDI et al., 2018). Outrossim, crescentemente, de acordo com Gillan et al. (2021), a métrica de avaliação de desempenho de sustentabilidade das empresas conhecida como ESG – Environmental, Social, and Governance (em português, Ambiental, Social e de Governança) tem se tornado tendência no mundo do empreendedorismo e de investimentos.

2.3.1.1 Agenda 2030 e o empreendedorismo sustentável

A Agenda 2030 foi definida por meio da maior consulta global já realizada, unindo pela primeira vez de forma ampla e inclusiva as visões de lideres de governo, setor privado, academia e Organizações Não Governamentais (ONGs), trabalhando de maneira colaborativa para se estabelecer uma linguagem única e um propósito compartilhado. O setor privado foi envolvido pelas Nações Unidas para formulação desta agenda para tornar palpável a segunda premissa da Agenda 2030, que é o equilíbrio das três dimensões do desenvolvimento sustentável: social, ambiental e econômica. Além disso, sem o engajamento dos negócios, o alcance das metas e objetivos seria comprometido. A ONU espera a contribuição das empresas por meio de seus principais negócios, avaliando seus impactos, estabelecendo metas ambiciosas e comunicando seus resultados de forma transparente (UNGC; PNUD; PRIME, 2018).

Os 17 ODS elencados na Agenda 2030 e suas 169 metas são uma oportunidade única de converter as necessidades e ambições da sociedade em novos negócios, através de quatro temas principais: crescimento, risco, capital e propósito. Desta forma, há um interesse vital dos negócios em assegurar a implementação da Agenda 2030 e seus objetivos (WBCDSD, 2016; UNGC; PNUD; PRIME, 2018; DHAHRI; OMRI, 2018; ICE, 2019; EY, 2017; GRI; UNGC, 2019).

Os ODS fornecem uma estrutura universal e visionária, sendo uma grande oportunidade para as empresas ligar estratégias de negócios com prioridades globais e locais, moldando, orientando, comunicando e relatando suas estratégias, metas e atividades, o que lhes permite

capitalizar uma série de benefícios. Por conseguinte, além das necessidades de atender à demanda da sociedade por maior transparência e responsabilidade, como um motor de emprego, crescimento, desenvolvimento econômico e uma fonte de tecnologia e inovação, há várias razões convincentes para que as empresas busquem o impacto socioambiental e se envolvam com os ODS (EY, 2017; UNDP, 2014; WBCDSD, 2016), tais como (UNDP, 2014):

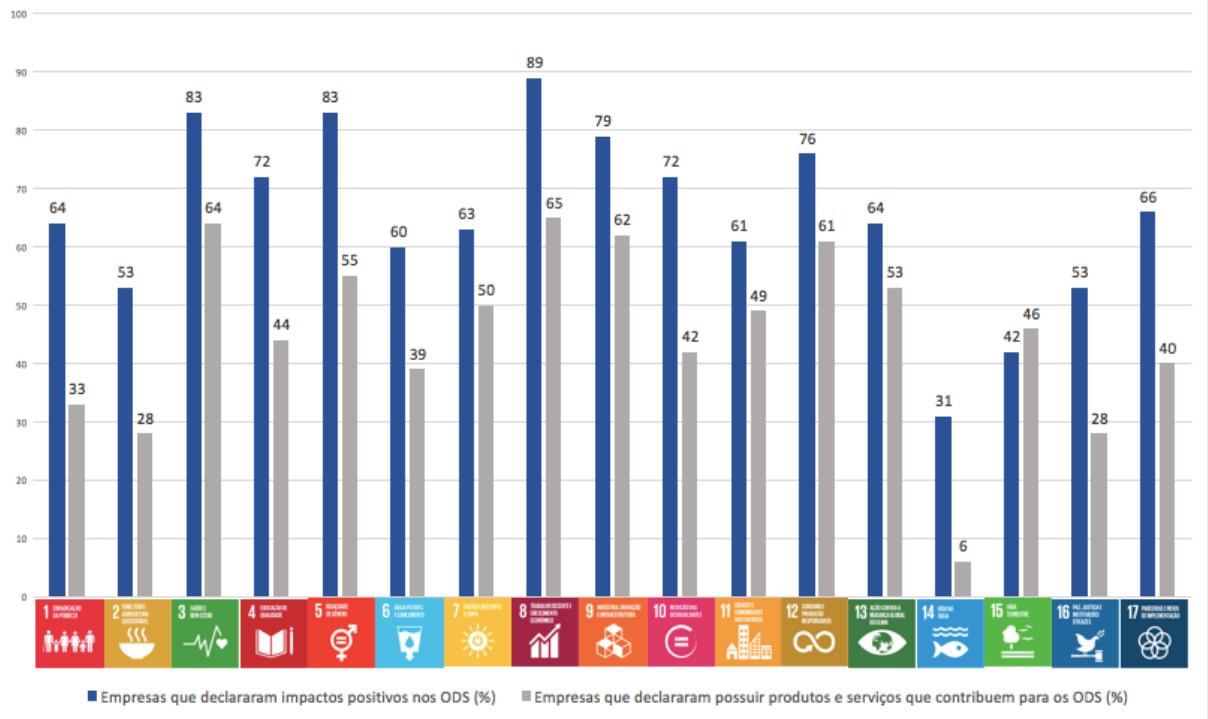
a) Gerar novas receitas criando novas oportunidades de diferenciação, expansão e crescimento de mercado, inclusive inovando para acessar mercados extremamente promissores que ainda não existem ou estão em seus primórdios;
b) Aumentar a atratividade do empregador para melhor recrutamento e retenção;
c) Aumentar a resiliência da cadeia de suprimentos, aprimorando a sustentabilidade da cadeia de suprimentos e a eficiência operacional;
d) Incentivar o interesse dos investidores, aumentando a atratividade para uma gama mais ampla de investidores;
e) Estar "à frente da curva" ao garantir a licença para operar, abordando a conformidade regulatória e gerenciando riscos.

De acordo com Siqueira et al. (2022), os investidores estão cada vez mais interessados em empreendimentos sustentáveis e as startups de impacto que apresentem respostas a problemas sociais, ambientais e econômicos. Neste sentido, as empresas devem compreender os ODS como uma oportunidade única de converter necessidades e ambições da sociedade em oportunidades de negócios (UNGC; PNUD; PRIME, 2018), considerando que investimentos em todo o mundo tem demonstrado todo o potencial do setor privado para impulsionar áreas de impacto que se alinham claramente com os ODS (GIIN, 2016). De acordo com WBCSD (2016), a Agenda 2030 pode gerar, no mínimo, 12 bilhões de dólares por ano em oportunidades de mercado, bem como criar até 380 milhões de novos empregos até seu prazo final. O IPCC de 202 afirma que o financiamento climático para a mitigação deve ser de 3 a 6 vezes maior até 2030 para limitar o aquecimento global a 2 ^{o}C (IPCC, 2022).

Muitas empresas parecem compartilhar das visões para o desenvolvimento sustentável e tem já se engajado nos ODS de diversas formas, o que é um bom começo. Porém, para alcançar os ODS há uma necessidade de que mais empresas mudem alguns aspectos e, em alguns casos, façam coisas diferentes (PEDERSEN, 2018), mensurando seus principais impactos, estabelecendo metas para mitigar os impactos negativos e potencializar os positivos (UNGC; PNUD; PRIME, 2018).

Outrossim, mundialmente já existem empresas que relatam estar alcançando e impactando positivamente alguns ODS, bem como para quais ODS as mesmas possuem produtos ou serviços que diretamente conduzem ao atingimento das metas. A Figura 10 demonstra que os objetivos mais impactados positivamente pelas empresas são ODS 3 (Saúde e Bem Estar), 5 (Igualdade de Gênero) e 8 (Trabalho Descente e Crescimento Econômico) e que as mesmas empresas possuem serviços e produtos principalmente para os ODS 3 (Saúde e Bem Estar), 8 (Trabalho Descente e Crescimento Econômico) e 9 (Indústria, Inovação e Infraestrutura).

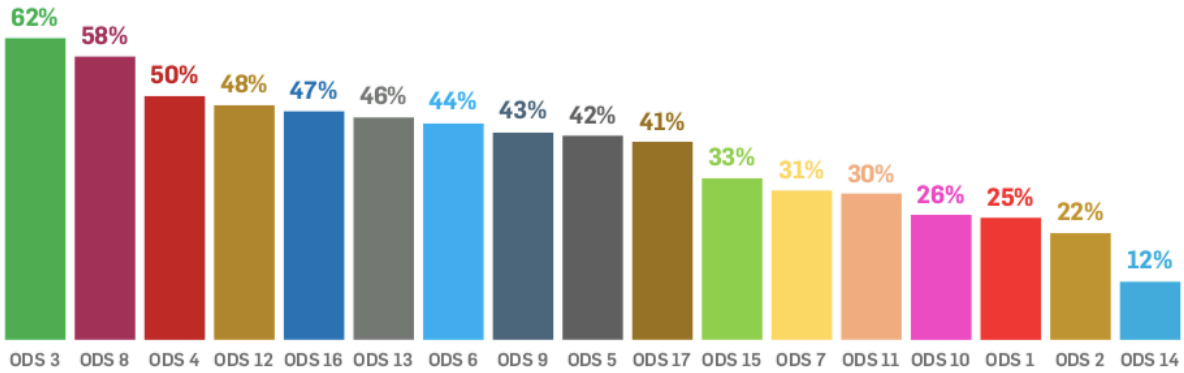
Figura 10 - Empresas que impactam cada ODS (%).



Fonte: Adaptado de UNGC; PNUD; PRIME (2018).

Assim como no âmbito mundial, muitas empresas brasileiras já atuam e relatam tópicos cobertos pelos ODS, havendo um avanço no planejamento de estratégias relacionadas aos ODS, sendo o ODS 3 – Saúde e Bem Estar – o mais representativo nas ações estratégicas das empresas, conforme demonstra o gráfico da Figura 11 (UNGC; PNUD; PRIME, 2018).

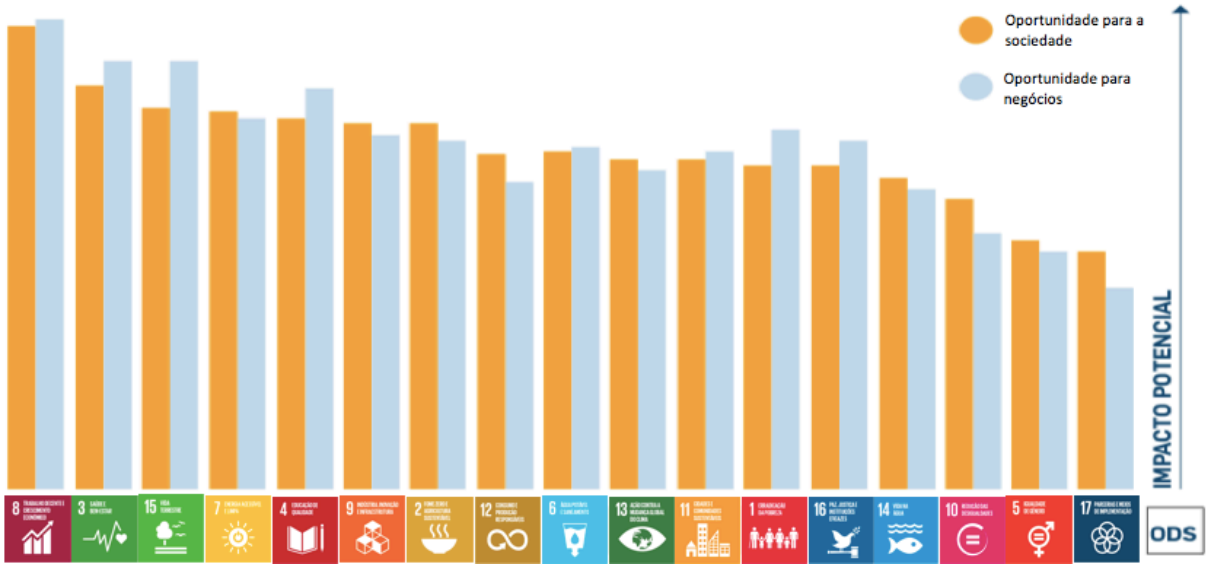
Figura 11 - Representatividade dos ODS nas ações estratégicas das empresas brasileiras.



Fonte: Adaptado de UNGC; PNUD; PRIME (2018).

Considerando a perspectiva das empresas brasileiras no que tange oportunidades de atuação das empresas para a sociedade e para novos negócios, o ODS 8 (Trabalho Descente e Crescimento Econômico) destaca-se, seguido pelo ODS 3 (Saúde e Bem Estar) e o 15 (Vida Sobre a Terra). A Figura 12 demonstra os ODS destacados pelas empresas nestes aspectos.

Figura 12 - Perspectiva das empresas brasileiras em oportunidades para a sociedade e para novos negócios.



Fonte: Adaptado de UNGC; PNUD; PRIME (2018).

Ao encontro dessas iniciativas, bem como da premissa de que as empresas desempenharão um papel fundamental no cumprimento das 169 metas contidas nos 17 ODS, que definem, dentro da realidade de cada um dos 193 países signatários, as prioridades para uma economia próspera e equitativa, o Guia dos ODS para Empresas é a principal metodologia de implementação dos ODS para os negócios, ou seja, um fomentador da inserção dos ODS no segmento do empreendedorismo, orientando o setor privado nesse novo cenário, promovendo

o entendimento sobre o processo de construção e definição dos ODS dentro do cenário empresarial e da cadeia de valor através de um passo a passo de internalização dos objetivos na estratégia dos negócios. Este guia apresenta cinco passos que estabelecem um ciclo virtuoso de implementação dos ODS no ambiente empreendedor (UNGC; PNUD; PRIME, 2018; WBCSD, 2016).

As metas de sustentabilidade da empresa devem ser parte integrando do conjunto completo de metas financeiras, estratégicas e operacionais, juntamente com as metas para outras áreas afins, integrando os ODS na cultura das organizações e também nos relacionamentos com os fornecedores na cadeia de valor. Entretanto, um dos principais desafios para as empresas é priorizar os ODS, considereando o aumento dos impactos positivos e a redução dos negativos, embasando melhores elementos para a tomada de decisão (UNGC; PNUD; PRIME, 2018; WBCSD, 2016).

Ainda há espaço para avanços na implementação de estratégia dos ODS por parte do setor privado (GRI; UNGC, 2019; UNGC, PNUD, PRIME, 2018), bem como as parcerias público-privadas serão chaves para alcance das metas da Agenda 2030 (UNGC; PNUD; PRIME, 2018), uma vez que há um consenso de que apenas os recursos oriundos do governo, do investimento social privado, dos organismos multilaterais e da filantropia não são suficientes para resolver os complexos problemas socioambientais que maculam a população brasileira e mundial e implicam em mazelas crônicas (BOMBARDI et al., 2018). Sendo assim, o caminho para o atingimento dos ODS passa necessariamente pela atuação do setor privado, capaz de investir seus recursos humanos e financeiros para o enfrentamento de tamanho desafio (UNGC; PNUD; PRIME, 2018).

2.3.1.2 Environmental, Social and Governance (ESG)

Em 2004, o Secretário-Geral da ONU clamou às instituições financeiras um posicionamento sobre as questões de sustentabilidade. Desta forma, surgiu o conceito de ESG, o qual foi apresentado em um relatório desenvolvido por 20 instituições financeiras (GILLAN et al., 2021). Através desta métrica, os mercados financeiros claramente demonstram comprometimento através de critérios ambientais, sociais e de governança em decisões de investimento (FRIEDE et al., 2015). O ESG refere-se a como as corporações e investidores integram as preocupações ambientais, sociais e de governança em seus modelos de negócio (GILLAN et al., 2021). A Figura 13 demonstra alguns portfólios correlatos aos diferentes eixos da métrica ESG.

Figura 13 - Possíveis ações voltadas às preocupações sociais, ambientais e de governança corporativa.

Fonte: Adaptado de Sustainability Academy (2022).

O fator ambiental refere-se ao consumo de recursos naturais não renováveis pela atividade econômica e o fator social, o quanto que isso retorna em geração de valor à sociedade. Por sua vez, o termo Governança significa a forma com a qual a empresa é gerenciada, a relação com seus colaboradores e questões éticas. Desta forma, o índice ESG tem o potencial de demonstrar se uma atividade econômica é sustentável a médio e longo prazo (PUZZONIA, 2018).

ESG indica um comprometimento das empresas com o meio ambiente, sociedade e respeito à diversidade (PUZZONIA, 2018). Devido à crescente conscientização e promoção do desenvolvimento sustentável, atualmente, as estratégias orientadas para o ESG têm se destacado para as atividades de investimento responsável (XUE et al., 2019; IONESCU et al., 2020; ZHANG, 2021). Puzzonia (2018) considera os aspectos de ESG os fatores mais importantes de um negócio de sucesso, de diferenciação para investimentos, de orientação para políticas de grandes fundos financeiros ou de reputação de empresas. As empresas devem ter habilidade de responder aos riscos e oportunidades de ESG, a fim de buscar a geração de valor, cada vez mais considerado mais do que capital financeiro acumulado (ADAMS, 2017).

Siqueira et al. (2022) mencionam que tanto o ESG quanto os ODS buscam atingir o ideal de uma sociedade sustentável, resolvendo desafios de ordem social, ambiental e

econômica. Investimentos em inovações e organizações sustentáveis tem se intensificado uma vez que o cenário pós-Covid exige uma recuperação sustentável e resiliente

Esta é uma tendência global que atualmente tem como sido monopolizada na Europa e Estados Unidos, os quais detém 90% do mercado de investimentos (XUE et al., 2019). A fim de resgatar a confiança de investimentos do exterior, no início de 2021 o Tesouro Nacional Brasileiro anunciou estar estudando a emissão de títulos públicos com selo ESG, concedido aos ativos que prezam pelas boas práticas ambientais, sociais e de governança corporativa, ou seja, investimentos em empresas ou organizações que demonstrem comprometidas com a redução dos impactos negativos decorrentes de seus negócios (ESTADÃO, 2021).

Um investimento será considerado ESG quando tiver intenções genuínas de mobilizar recursos a fim de melhorar aspectos relacionados ao meio ambiente, à sociedade/stakeholders ou à governança corporativa (ADAMS, 2017; ESTADÃO, 2021). Xue et al. (2019) afirmam que as startups vocacionadas para ESG são potenciais promotoras de desenvolvimento sustentável. Exponencialmente, observa-se um crescimento no lançamento de carteiras de ações ESG por corretoras e instituições financeiras. Recentemente, o BNDES selecionou 25 startups para o programa BNDES Garagem – Negócios de Impacto, que servirá como apoio para alavancar seus negócios e inovações (BNDES, 2021).

Além das instituições financeiras, preocupadas e alinhadas com suas agendas estratégicas e organizacionais ESG, grandes companhias estão apoiando e investindo em startups com ações que geram impacto socioambiental. A empresa detentora da marca Johnnie Walker tem uma agenda global orientada para a geração de impacto socioambiental, buscando inovação em startups que tem compromisso em promover soluções que corroborem com os ODS (INNOVATION LATAM, 2022). O Instituto Votorantim é outro case de empresa que lançou o iV Ventures, um fundo de investimentos de R$ 20 milhões que apoiará startups de impacto socioambiental em fase inicial de desenvolvimento (INSTITUTO VOTORANTIM, 2022).

Recentemente, além dos selos ESG, diversos instrumentos financeiros tem sido criados para viabilizar a captação de capital financeiro voltado ao empreendedorismo sustentável, tais como: Títulos Verdes, Títulos Sociais, Títulos Sustentáveis e os chamados Green, Social, Sustainability e Sustainability-Linked Bonds. Estes instrumentos tem como propósito a geração de impacto socioambiental positivo ou o alcance de metas ESG (ESTADÃO, 2021; ADAMS, 2017).

Além de ser utilizada como critério na obtenção de recursos de investimento e oportunidades de linhas de fomento e financiamento, a adoção do ESG, sob uma perspectiva de

marketing, pode melhorar a reputação da organização e trazer benefícios às empresas, podendo aumentar as receitas para as primeiras a adotarem, trazendo vantagens competitivas (IONESCU et al., 2020). Nada obstante, as empresas tentem a buscar impactar positivamente e gerar valor a todos que possam ser afetados direta e indiretamente pelo sucesso da companhia – capitalismo das partes interessadas (colaboradores, fornecedores, consumidores, comunidades locais, governo e até mesmo concorrentes), indo ao encontro das premissas do empreendedorismo sustentável (ESTADÃO, 2021).

Puzzonia (2018) afirma que ainda há uma lacuna na atuação das universidades, detentoras de conhecimento e pesquisa, e que estas têm um papel fundamental de promoção de ambientes de inovação que abordem os aspectos de ESG para a promoção do empreendedorismo e da inovação sustentável, uma vez que as "startups são viabilizadoras eficientes de inovações em favor da sociedade que possibilitam práticas sustentáveis", viabilizando ações estratégicas voltadas ao ESG (SIQUEIRA et al., 2022).

2.3.1.3 Negócios de impacto

Negócios de impacto, negócios sustentáveis, empreendimentos sociais, negócios sociais, negócios inclusivos, negócios socioambientais, negócios com soluções de impacto social e ambiental, negócios voltados para a base da pirâmide são alguns dos termos usados atualmente para explicar as organizações que visam à solução de problemas socioambientais com eficiência e à sustentabilidade financeira por meio de mecanismos de mercado. Independentemente ao que conceito polissêmico que a literatura acadêmica apresenta, a nomenclatura mais difundida entre os atores é Negócios de Impacto (PNUD, 2018).

Os negócios de impacto surgem como uma forma de intervenção socioeconômica com uma missão explicita que integra diferentes atores impactados ou impactantes, na busca por inovação, transformação social e desempenho financeiro. A aspiração de todo o ecossistema é ver inovações que criem novos mercados, tenham impacto socioambiental e sustentabilidade financeira, simultaneamente (FTFS, 2015; BOMBARDI et al., 2018).

De acordo com PNUD (2018), a Carta de Princípios para Negócios de Impacto, documento que conceitua e parametriza os negócios de impacto no Brasil, enfatiza que um negócio de impacto se difere do modelo tradicional de negócio e de organizações não governamentais pelos seguintes princípios:

a) Tem propósito de gerar impacto positivo explícito na sua missão;
b) Conhecem, mensuram e avaliam seu impacto periodicamente;

c) Tem uma lógica econômica (comercializam produtos e serviços) que permite gerar algum tipo de receita própria;
d) Possuem uma governança que leva em consideração os interesses de investidores, clientes e comunidade.

Enquanto o principal objetivo dos negócios tradicionais é maximizar os lucros, no empreendedorismo de impacto, a principal meta é gerar uma transformação positiva na sociedade, que seja capaz de melhorar a vida das pessoas em algum aspecto, sem ignorar a preocupação de ter retorno financeiro, unindo o desejo de empreender e lucrar com a vontade de transformar o mundo e fazer a diferença na sociedade (ICE, 2019).

Outrossim, ressalta-se que o negócio de impacto não tem o mesmo significado que filantropia, ou seja, não se trata de doações ou de dedicar apenas parte do tempo ou dos recursos a uma ação social, mas tem como objetivo maior, como proposta de valor, transformar uma realidade e buscar a solução de um problema ambiental ou social. Além disso, apenas incluir pessoas com baixa renda na cadeia de suprimentos ou no quadro social não significa gerar impacto social (ICE, 2019).

Para identificar os impactos que o negócio irá gerar, a ferramenta de avaliação mais disseminada entre os negócios de impacto é a Teoria da Mudança, a qual cria um quadro para examinar não apenas se um programa, negócio ou projeto é efetivo, mas também como, porquê e sob quais condições funciona ou não (BOMBARDI et al., 2018; SCHINDLER et al., 2017). O modelo Canvas é outra ferramenta utilizada para avaliar negócios de impacto (BOMBARDI et al., 2018), a qual recentemente foi adaptado considerando questões de sustentabilidade como é o caso dos modelos SDG Canvas e Sustainable Business Model Canvas. Por sua vez, o Modelo C integra a Teoria da Mudança e o modelo Canvas (ICE, 2019).

Considerando que os Negócios de Impacto têm como objetivo promover inovações na maneira de empreender, pensar e conduzir negócios, inclusive de forma mais ética e humana, existem algumas premissas básicas a serem observadas por esses empreendimentos, as quais estão alinhadas com as ações observadas pelo ESG. Tais premissas são (FTFS, 2015):

- Cumprimento de todas as legislações vigentes (fiscal, trabalhista e ambiental;
- Pagamento de salários adequados;
- Consulta e transparência na tomada de decisões, como forma de manter diálogo com públicos de interesse sobre ações que impactam suas dinâmicas e expectativas;
- Operação em rede e por meio de parcerias;

- Respeito à diversidade e aos direitos humanos e sensibilidade ao patrimônio histórico e cultural de povos e regiões.

A possibilidade de atuação dos Negócios de impacto é ampla e este modelo se mostra cada vez mais uma alternativa inteligente, inovadora e benéfica para a sociedade do século XXI, desafiada a solucionar questões sociais e ambientais que vão além de doações e ações governamentais (FTFS, 2015; BOMBARDI et al., 2018).

O tema de negócios de impacto socioambiental começou a ser moldado no fim dos anos 90 no Reino Unido e nos Estados Unidos, consolidando-se a partir de 2007, o que culminou em um movimento global. Atualmente, estima-se que há uma demanda mundial por um capital de 2,5 trilhões de dólares em investimentos socioambientais, lacuna que os negócios de impacto podem ajudar a preencher (BOMBARDI et al., 2018). Os negócios de impacto são recentes no Brasil, mas apresentam um ritmo acelerado de crescimento com um volume de projetos de impacto em eclosão pelo país, que atingiu, em 2014, R$13 bilhões de investimentos em atividades que produzem impacto socioambiental e retorno financeiro (PNUD; SEBRAE, 2018; ICE, 2019; BOMBARDI et al., 2018).

O governo brasileiro assumiu seu papel no ecossistema de impacto apenas em 2016, contudo posicionou-se como protagonista mundial em políticas públicas nessa área (ICE, 2019; BOMBARDI et al., 2018). Em 2017, a Estratégia Nacional para Investimentos e Negócios de Impacto (ENIMPACTO) foi institucionalizada, objetivando articular diferentes órgãos de governo, bem como parceiros da sociedade (entidades empresariais, fundacionais, organizações não governamentais, comunidade científica e tecnológica) na promoção de um ambiente favorável ao desenvolvimento de empreendimentos capazes de gerar soluções de mercado para os problemas sociais e ambientais brasileiros, consolidando o movimento e atraído a atenção de diferentes esferas da sociedade (BOMBARDI et al., 2018).

Esta estratégia foi reconhecida como benchmarking pela Organização para a Cooperação e Desenvolvimento Econômico (OECD), incentivando outros países a seguirem o mesmo caminho, sobretudo as economias em desenvolvimento, onde os recursos são mais escassos. O ENIMPACTO alinha as prioridades nacionais com as internacionais e escolheu quatro grandes áreas de atuação: aumento do capital disponível para investimento e financiamento, elevar o número de negócios de impacto, fortalecer os intermediários (incubadoras, aceleradoras, universidades etc.) e aperfeiçoar o marco regulatório para este segmento (ICE, 2019; BARBOSA; SETUBAL, 2017).

Entretanto, a distribuição regional e setorial dos negócios de impacto ainda não é homogenia para atingir todos os desafios socioambientais em uma ampla escala (PNUD; SEBRAE, 2018; ICE, 2019). De acordo com ICE (2019), uma pesquisa do SEBRAE em 2017 apontou que muitos empreendedores ainda não conhecem, de fato, o que é um negócio de impacto ou pensam que estão colocando este tipo de empreendedorismo em prática quando, na verdade, não estão.

O ecossistema dos negócios de impacto deve estar fortalecido, visto que os atores deste ecossistema são parte fundamental para estimular a pulverização e desenvolvimento de um modelo de negócios mais inovador, robusto, consolidado e escalável a longo prazo (FTFS, 2015; PNUD; SEBRAE, 2018). De acordo com a Carta de Princípios para Negócios de Impacto no Brasil, as incubadoras são organizações intermediárias que atuam no ecossistema de negócios de impacto e funcionam como um elo entre a oferta e a demanda de capital, podendo potencializar e acelerar os negócios de impacto. No Brasil, a taxa de mortalidade de empresas que passam pelo processo de incubação em seu estágio inicial é reduzida de 70% para 20% em comparação com as empresas que não passam por uma incubadora. Isto evidencia que as parcerias são chave para alcançar as metas dos novos modelos de negócios (FTFS, 2015; UNGC; PNUD; PRIME, 2018; ICE, 2019).

2.3.1.4 Educação para o Desenvolvimento Sustentável

Educação para o Desenvolvimento Sustentável (EDS) é o empoderamento através do conhecimento, perspectivas, habilidades, competências e valores para proteger o planeta e a sociedade (UNESCO, 2017). Este conceito aborda igualmente princípios ambientais, do contexto sociocultural e fatores sócio-políticos (VENKATARAMAN, 2009). De acordo com a UNESCO (2017), a educação pode ajudar a transpor a sustentabilidade teórica em prática.

A Década da Educação para o Desenvolvimento Sustentável ocorreu entre 2005 a 2014, firmando o conceito de educação orientada para a sustentabilidade em todos os níveis (UNESCO, 2017). Desde 2015, ratificando este movimento, desde 2015, a Agenda 2030 da ONU clama pela luta por uma educação holística, integrada e interdisciplinar (LOVREN, 2017), trazendo um ODS dedicado à educação e mencionando em sua meta 4.7 que, até 2030, todos adquiram conhecimento e habilidades necessárias para promover o desenvolvimento sustentável (UN 2016).

As universidades têm um notável papel de liderança e mentoria na sociedade, adaptando-se aos diferentes contextos e necessidades (WHITE, 2015). As instituições de ensino superior precisam desenvolver cidadãos preocupados e sensibilizados com as questões de

sustentabilidade, buscando impactar positivamente com suas ações profissionais (LEAL FILHO et al., 2019). Dentro do contexto das universidades, a EDS pode transpor os limites da sala de aula, sendo as incubadoras de empresas associadas ou gerenciadas pelas universidades ninhos férteis para o desenvolvimento de negócios sustentáveis a partir do ensino e aprendizagem da sustentabilidade. Brito et al. (2018) advogam que investimentos em EDS em incubadoras universitárias são fundamentais para o desenvolvimento de negócios que buscam ser sustentáveis, não apenas do ponto de vista financeiro. Entretanto, estes investimentos ainda são incipientes, impactando negativamente o desenvolvimento de inovações e startups sustentáveis.

Nitidamente, empreendedores que desejam alinhar seus modelos de negócios aos princípios de sustentabilidade devem buscar em primeira instância educar-se para o desenvolvimento sustentável, ou seja, desenvolver e despertar a conscientização ambiental, bem como habilidades, competências e perspectivas capazes de gerar produtos, serviços e modelos de negócios que impactem positivamente a sociedade e o meio ambiente (STRACHAN, 2018).

2.4 INOVAÇÃO ORIENTADA PARA A SUSTENTABILIDADE

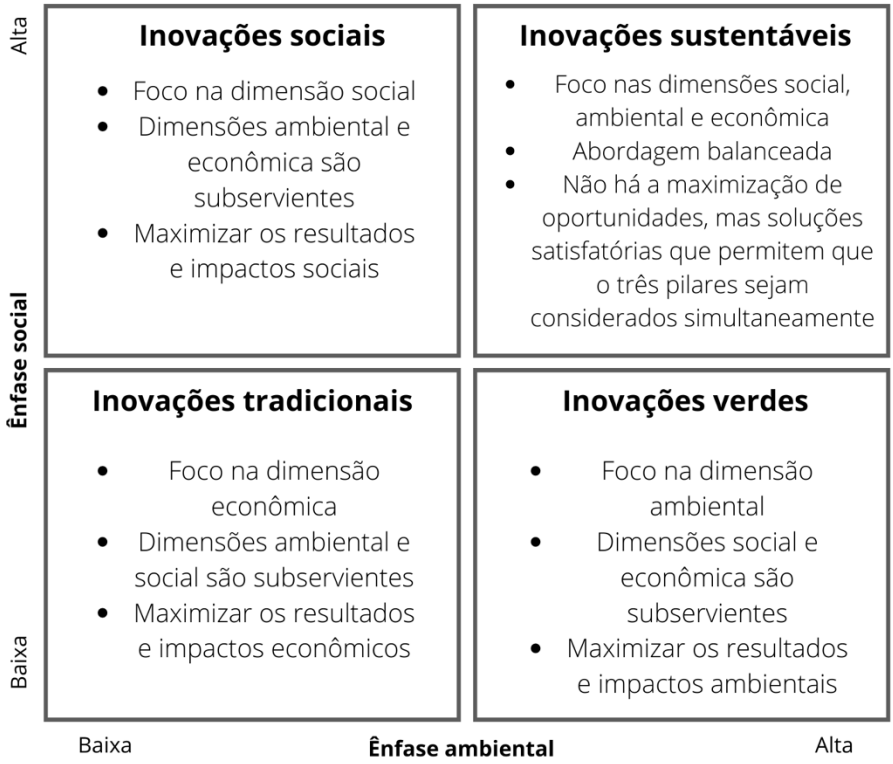
O papel da inovação em promover a sustentabilidade tem recebido uma grande atenção no campo científico na ultima década (CILLO et al., 2019). Carayannis et al. (2017) afirmam que a inovação sustentável deve, além de garantir a competitividade financeira e econômica do negócio, mas também promover benefícios ambientais e assegurar o bem-estar social. Devido a sua relevância no que tange o desempenho financeiro, ambiental e social, a inovação orientada para a sustentabilidade deveria guiar todos os produtos e serviços das empresas, especialmente das nascentes (BOONS; LÜDEKE-FREUND, 2013).

Uma crescente demanda por negócios que atendam fatores de ESG é notável. Clientes e investidores estão demonstrando interesse gritante no que tange o desempenho sustentável de produtos e serviços (CILLO et al., 2019).

Mesmo apresentando diversos pontos positivos e impulsionadores, a inovação sustentável é difícil de ser desenvolvida de forma isolada, requer a colaboração de entidades e organizações para ser bem-sucedida (CAPPA et al., 2016). Diante disso, as incubadoras de empresas desempenham um papel fundamental na promoção de negócios que observem princípios de sustentabilidade em seus produtos e serviços inovadores, bem como a conexão das empresas com outras organizações que possam potencializar estas inovações (BANK et al., 2017).

Silvestre e Ţîrcă (2019) propõem um modelo teórico, baseado nas dimensões social e ambiental do desenvolvimento sustentável. O modelo se propõe como uma forma de descrever como as inovações variam em termos conforme sua natureza e os desafios que visam atingir. Eles utilizaram combinações ilustrativas de alta ou baixa ênfase nos desafios ambientais e sociais. Quatro tipos de inovação são mencionados: tradicional, verde, social e sustentável. A Figura 14 demonstra o modelo proposto.

Figura 14 - Modelo teórico de inovações sustentáveis



Fonte: Adaptado de Silvestre e Ţîrcă (2019).

A inovação orientada para a sustentabilidade, de acordo com Silvestre e Ţîrcă (2019), se difere das demais pelo fato de apresentar uma elevada ênfase ambiental e social, como não maximizar oportunidades, apresentando soluções satisfatórias para os três pilares da sustentabilidade.

2.4.1 Incubadoras de empresas

As incubadoras de empresas são ambientes intermediários dentro de um ecossistema de inovação, ou seja, organizações especializadas que facilitam, conectam e apoiam a parceria entre oferta e demanda de capital, bem como qualificam a construção do ecossistema (DELOITTE, 2015).

Há muitas definições para incubadoras de empresas (AL-MUBARAKI; BUSLER, 2013). De forma geral, a incubadora é uma entidade promotora de empreendimentos inovadores com suporte para empreendedores que desejam desenvolver novas ideias e transformá-las em empreendimentos de sucesso, através de infraestrutura, capacitação e suporte gerencial, orientando sobre aspectos administrativos, comerciais, financeiros e jurídicos, entre outras questões essenciais ao desenvolvimento de uma empresa (BOMBARDI et al., 2018). As incubadoras de empresas são consideradas instrumentos de políticas públicas para a promoção da inovação, empreendedorismo e a criação de novos pequenos negócios, ofertando suporte técnico e de gestão através de esforços internos e através de conexões com redes de contato cooperativas externas (SCHWARTZ; HORNYCH, 2010).

As incubadoras provem um ambiente propício e adequado para abrigar micro e pequenas empresas, especialmente as de base tecnológica. Historicamente, os programas de incubação têm como propósito auxiliar os empreendedores na maturação de seus negócios, por meio de ações que permitam adquirir conhecimentos e desenvolver habilidades de gestão empresarial, bem como conferir ao empreendimento características fundamentais à competitividade (BIZZOTTO; PIRES; CHIERIGHINI, 2016). Elas oferecem facilidades, tais como: (a) serviços de apoio (assessorias em gestão administrativa, financeira, contábil, jurídica, de marketing, de qualidade e de pessoas, dentre outras); (b) revisão do modelo de negócios (conhecimento de mercado, identificando se o modelo atual realmente aproveita todas as oportunidades do mercado e se conta com todos os recurso necessários para alcançar suas potencialidades); (c) assessoria tecnológica (conhecimento de tecnologias e seus aspectos legais, ideação, design, prototipagem, testes, etc.); (d) *coaching* e mentoria (acesso a especialistas e executivos) e (e) conexões (acesso a fontes de financiamento, executivos e especialistas), objetivando alavancar os recursos existentes e fomentar a sinergia entre as empresa (STAL et al., 2016; DELOITTE, 2015; BANK et al., 2017).

As incubadoras têm como principal propósito, ao final do período de incubação, ter apoiado de maneira satisfatória os empreendedores, no desenvolvimento de ideias e inovações tecnológicas e na transformação destes negócios em empresas de sucesso, financeiramente viáveis, com gestão adequada e bem posicionadas em seus mercados de atuação, reduzindo a taxa de mortalidade das empresas locais (STAL et al., 2016; BIZZOTTO; PIRES; CHIERIGHINI, 2016; BOMBARDI et al., 2018; AL-MUBARAKI; BUSLER, 2013). Em contrapartida, as empresas graduadas do processo de incubação, ou seja, que passaram com êxito desta fase, contribuem na geração de empregos e renda, transferência de tecnologia,

comercialização de novas tecnologias e criação de valor para a economia local (BOMBARDI et al., 2018; AL-MUBARAKI; BUSLER, 2013).

Nesse sentido, as incubadoras são o mecanismo mais tradicional de geração de empreendimentos inovadoras. Sua origem data uma experiência em 1959 na cidade de Nova Iorque, Estados Unidos. Na década de 80, as incubadoras começaram a emergir no contexto europeu, sendo implementadas no Brasil como parte de políticas públicas nesta mesma época (ANPROTEC; SEBRAE, 2016.; ICE, 2019; BANK et al., 2017). Desde então, os programas de incubação de empresas têm se espalhado pelo Brasil e pelo mundo, encontrando um fértil campo para se desenvolver, adaptando-se às realidades locais e auxiliando empreendedores a acessar conhecimento, recursos e mercados. Assim, tornaram-se uma importante ferramenta no desenvolvimento do ecossistema empresarial e na geração de negócios inovadores.

Em 2016, o Brasil contava com 369 incubadoras em operação que apoiavam 2.310 empresas incubadas e haviam graduado 2.815 empresas. Em conjunto, essas empresas tinham um faturamento anual de R$ 15,30 bilhões, gerando 53.280 empregos (ANPROTEC, 2018). O movimento brasileiro de incubadoras tem enorme potencial influenciador na agenda empreendedora do Brasil, sendo reconhecido seu importante papel e sua expressiva contribuição para o desenvolvimento das diferentes regiões do país. Além de estar presente em todas as capitais brasileiras, as incubadoras tem se pulverizado para municípios menores, garantindo que "ninguém seja deixado para trás", premissa básica da Agenda 2030 para o desenvolvimento sustentável (BOMBARDI et al., 2018).

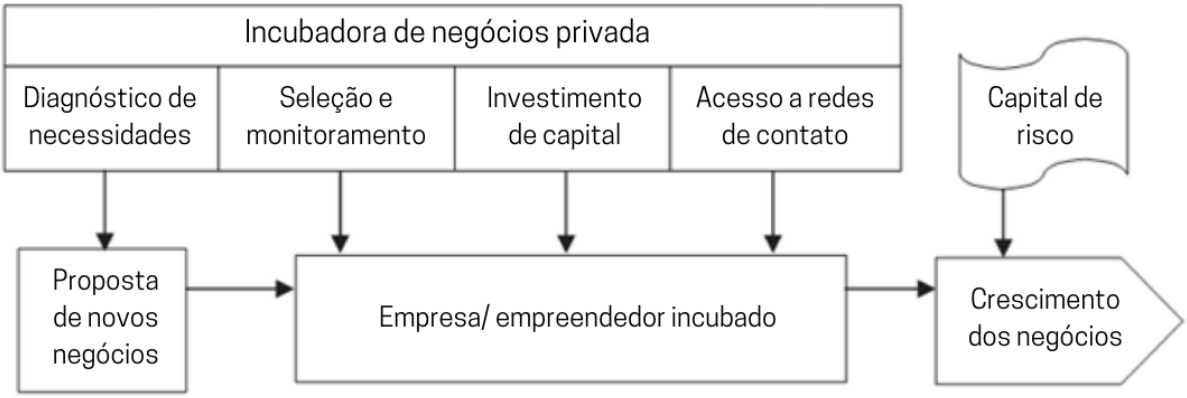
As incubadoras de empresas costumam estar vinculadas a instituições mantenedoras, tais como universidades públicas ou privadas, comunidades, institutos de pesquisa, iniciativas empresariais independentes, consórcios, organizações governamentais como prefeitura ou não governamentais como um ONG (ARANHA, 2002; ICE, 2019,). Não há um modelo único para uma incubadora, mas há uma grande variedade de formas de incubadoras, podendo ser os tipos divididos em muitas categorias. Considerando o foco da incubadora, o qual determina mercado-alvo, área geográfica, tecnologia ou estágio de desenvolvimento das empresas incubadas, as mesmas podem ser segregadas em: tradicional, mista, cultural, social, agroindustrial, de serviços e tecnológica (STAL et al., 2016; BIZZOTTO, 2003).

2.4.1.1 Modelos teóricos de incubadoras

Um modelo teórico é tangibilização de um sistema existente ou ideado, objetivando caracterizar, compreender, comunicar, explicar, integrar e desenhar aspectos de interesse neste sistema (DORI, 2002). O embasamento teórico de incubadoras de empresas envolve várias dimensões, dentre estas teorias de incubação, modos operacionais (físico e virtual), tipos de incubação (base tecnológica, vinculada a universidades, aceleradoras, sem fins lucrativos, dentre outros), serviços ofertados (mentorias, consultorias, financiamentos, ativos físicos e de apoio) (LOSE et al., 2020). O modelo de incubadoras de empresas envolve a implementação, o desempenho e a eficiência dos objetivos de inovação, envolvendo múltiplos stakeholders, instituições, muitas facilidades, serviços e ativos, infraestrutura e uma variedade de programas desenvolvidos para o empreendedorismo (SAPTONO et al., 2020). Desde 1985, cientistas, pesquisadores e gestores tem proposto modelos de incubadoras de negócios e de processos de incubação.

Em meados da década de 80, Campbell et al. (1985) propuseram um modelo de processo de incubadora com o objetivo de demonstrar as atividades chave de agregação de valor em uma incubadora, ou seja, diagnóstico dos negócios, seleção e monitoramento de serviços ofertados, investimento de capital e o acesso a rede de relacionamentos da incubadora. Figura 15 demonstra a figura-conceito do modelo de Campbell et al. (1985).

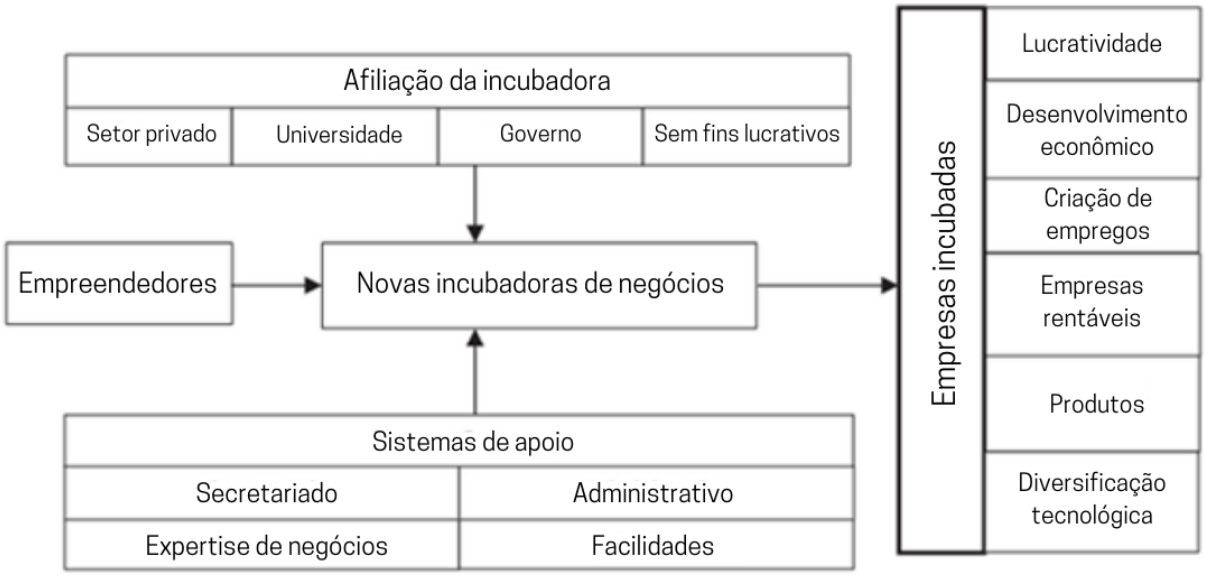
Figura 15 - Figura-conceito do modelo de incubação proposto por Campbell et al. (1985).



Fonte: Campbell et al. (1985).

Com o propósito de demonstrar que as incubadoras de negócios são mecanismos de transformação dentro do contexto de tríplice hélice, Smilor (1987) propôs um modelo estrutural tendo como base teórica o modelo de Campbell et al. (1985) e que apresenta os principais resultados (outcomes) das incubadoras de negócios. A Figura 16 demonstra a figura-conceito deste modelo.

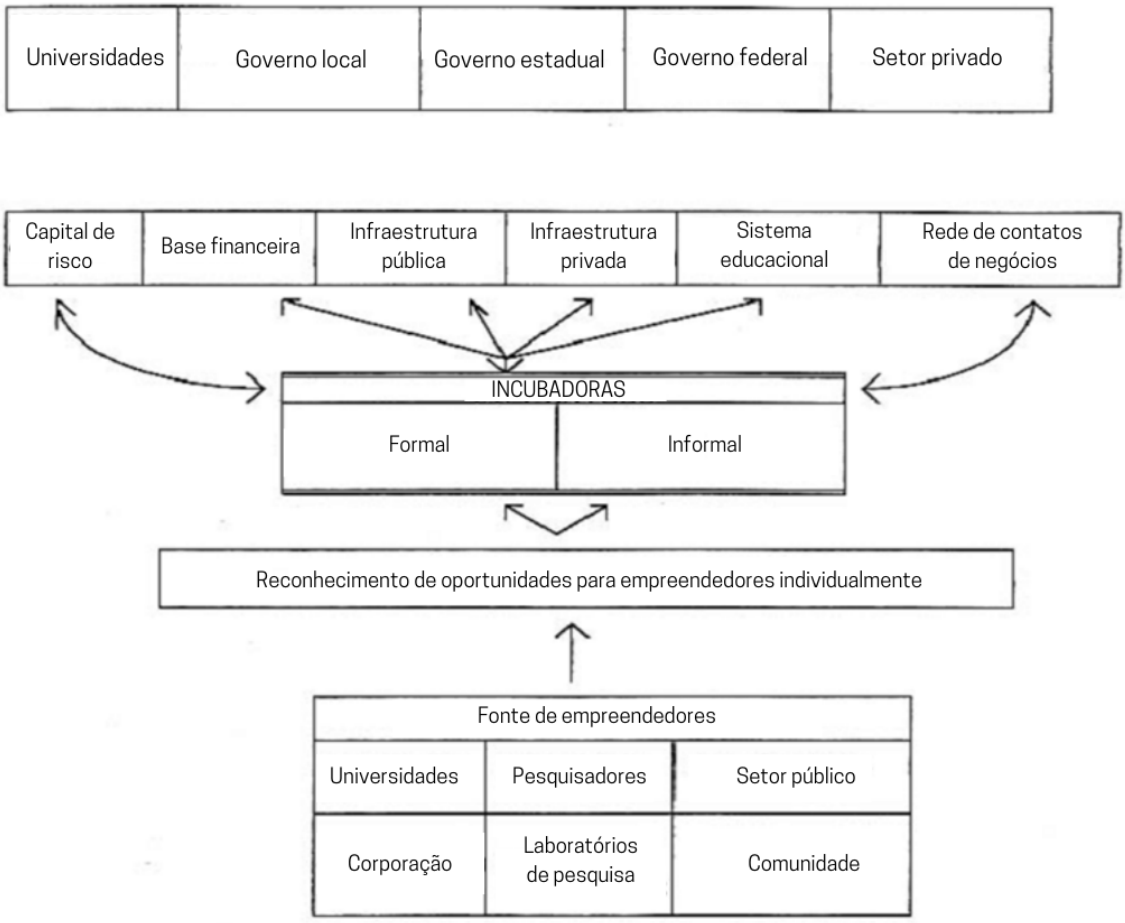
Figura 16 - Figura-conceito do modelo estrutural de uma incubadora proposto por Smilor (1987).



Fonte: Adaptado de Smilor (1987).

Combinando as duas primeiras propostas, outro modelo estrutural foi proposto em 1988 por Nijkamp e complementado por Smilor (1987), criando o Modelo Genérico de Incubadora de Nijkamp & Smilor (Figura 17), objetivando interpretar uma incubadora de negócios tradicional, apresentando os seus principais componentes estruturais. Este modelo destacou a importância de uma cultura empreendedora e a rede de contatos como fatores de sucesso de uma incubadora, que pode ser considerado um mediador ou intermediário entre empresários e a comunidade.

Figura 17 - Figura-conceito do Modelo Genérico de Incubadora de Nijkamp & Smilor.



Fonte: Adaptado de Ryzhonkov (2013).

Carter e Jones-Evans (2000) propuseram um modelo de incubação que identifica os passos chave baseados nas necessidades dos incubados. Os passos consistem na formulação de ideia (trabalho, treinamento, educação e criatividade), desenvolvimento (em redes, credibilidade), reconhecimento de oportunidades (ambiente econômico, atitudes culturais em relação ao risco, mudanças socioeconômicas e ambiente técnico), entrada e lançamento e planejamento e preparação (parcerias, pesquisa de mercado, acesso financeiro). Uma revisão do modelo foi proposta por Carayannis e Zedtwitz em 2005, acrescentando alguns serviços considerados essenciais: disponibilidade de recursos físicos, forte apoio administrativo, disponibilidade de recursos financeiros, introdução de apoio a negócios iniciantes e oportunidades de rede de contatos.

No mesmo ano de 2000, Novak e Grantham propõe um modelo estrutural para incubação virtual através de parcerias público-privada focado na formação de uma aliança estratégica (rede de inovação) para fornecer os principais ativos e auxiliar as startups a ter sucesso. Este modelo combina elementos de sucesso da incubação tradicional e novos

elementos focados em canais virtuais e alianças estratégicas. De acordo com Novak e Grantham (2000), os componentes deste modelo estrutural são:

- Foco em recursos humanos + foco no capital = fonte de integração de recursos;
- Foco na formação de alianças estratégias ajuda a trazer nutrientes chave para o sucesso;
- Validação do capital intelectual e gestão do conhecimento;
- Recursos baseados na internet;
- Soluções rentáveis (especialmente para incubadoras privadas);
- Setor privado atuando como líder, enquanto a universidade e o setor público dão apoio;
- Sistemas de gestão formalizados;
- Foco em mercados e negócios nacionais e internacionais;
- Trabalho em conjunto com incubadoras físicas quando necessário.

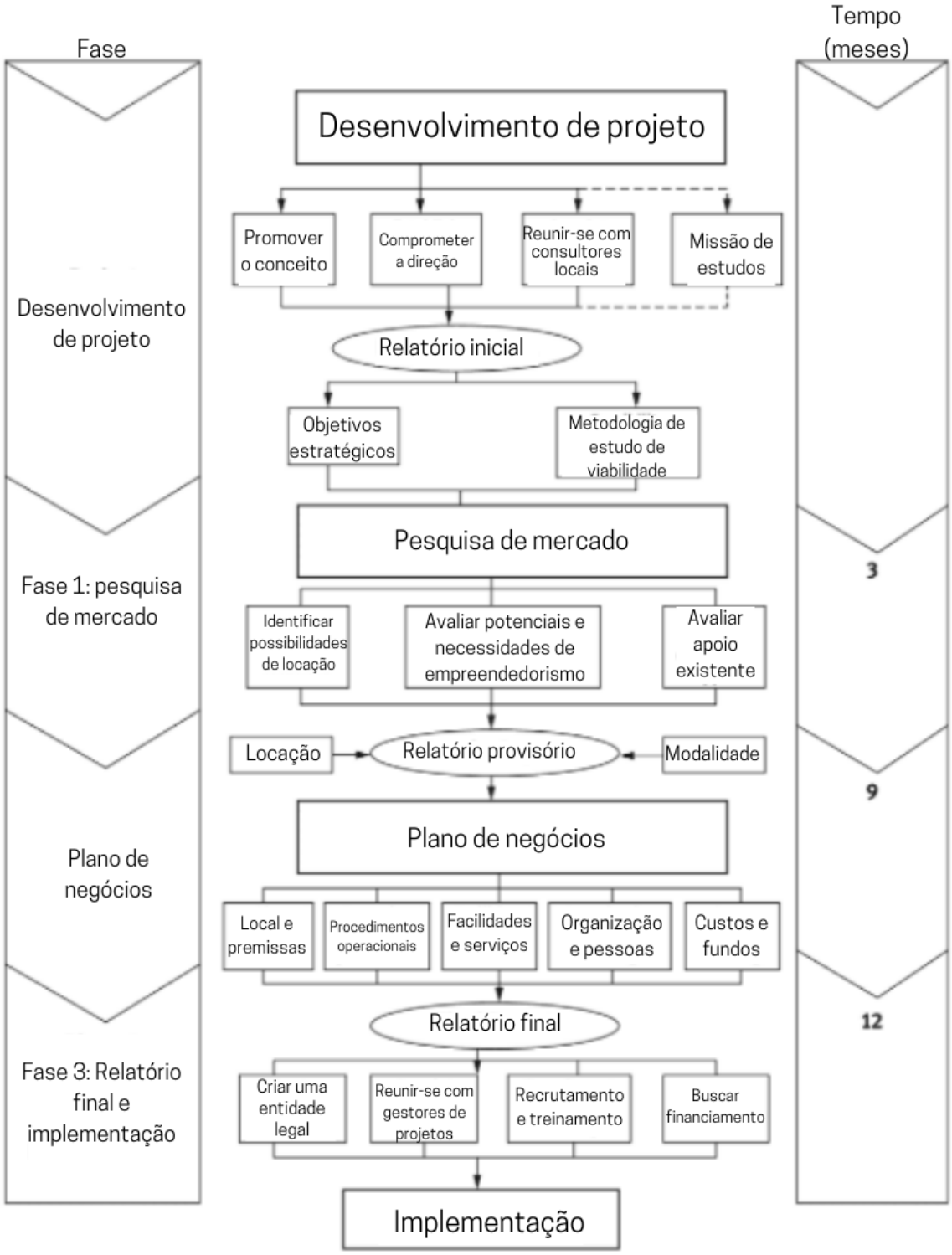
Ainda em 2000, um modelo de incubação corporativa surgiu através da proposta de Booz Allen Hamilton, o qual apresenta formas de reforçar e apoiar as praticas de inovação em incubadoras. Eles propõem que o processo de incubação é organizado em sete estágios a fim de reduzir as incertezas: ideação, conceito e triagem, prototipagem do negócio, preparação do lançamento, lançamento, escalonamento e transição (RYZHONKOV, 2013). O modelo (Figura 18) se apresenta como uma ferramenta sistemática para desenvolver projetos de risco em ambientes corporativos.

Figura 18 - Figura-conceito do modelo Booz Allen Hamilton (2000).

Fonte: Adaptado de Ryzhonkov (2013).

O modelo de incubadora de desenvolvimento proposto por Lalkaka, em 2000 – Technology Business Incubator Manual - apresenta um modelo estrutural e de processo, guiando estrategistas, educadores, patrocinadores e times de gerenciamento para explorar e estabelecer um programa de sucesso em incubadoras de base tecnológica. Este guia é composto por cinco partes: Conceitos de incubação, Planejamento, Implementação, Operação e Aprendizagem (RYZHONKOV, 2013). O modelo considera a incubadora como um negócio, assim como de seus incubados e pode ser observado na Figura 19.

Figura 19 - Figura-conceito do modelo proposto por Lalkaka.



Fonte: Adaptado de Ryzhonkov (2013).

Em 2002, Lazarowich e Wojciechowski descrevem um modelo estrutural para incubadoras da nova economia, ou seja, uma organização nascida a partir de capital de risco e grandes empresas de consultoria. A proposta é, na maior parte, incubadoras virtuais com o foco na geração de retornos em investimentos para seus próprios acionistas. O foco principal deste

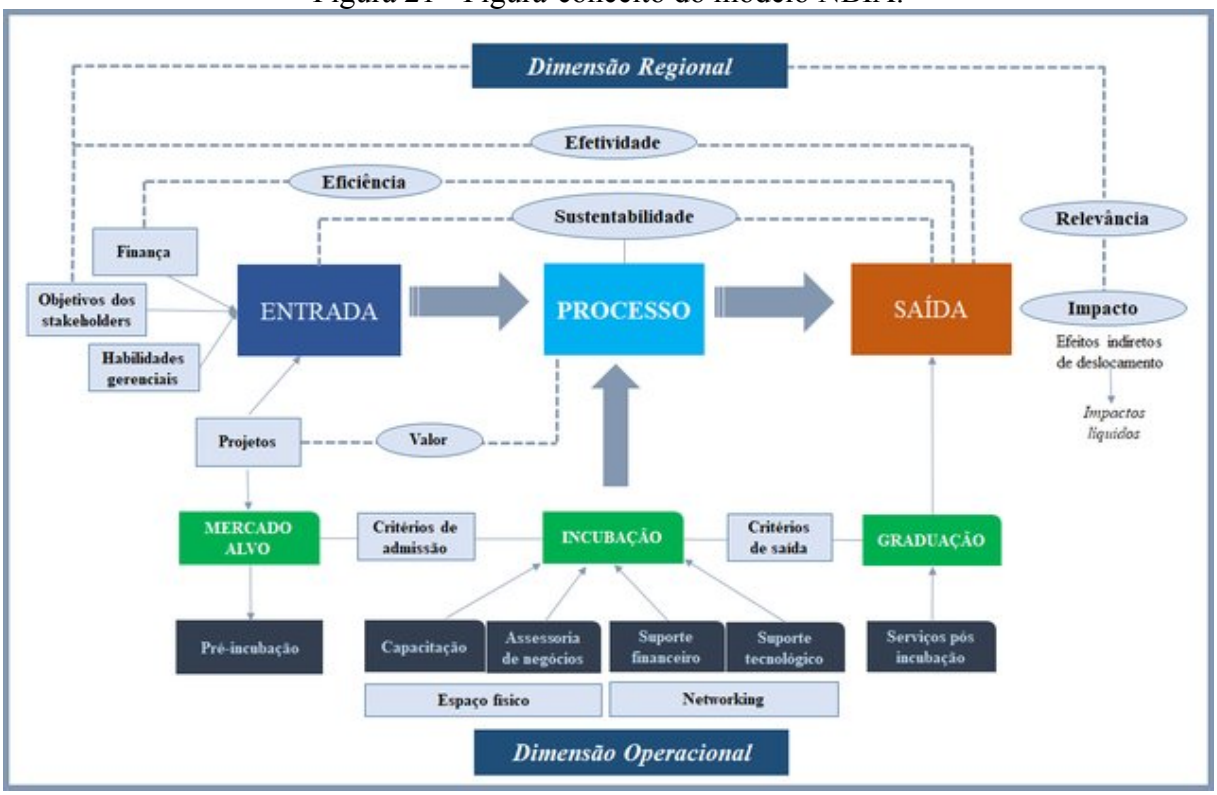
modelo de incubadora é em atividades de alta tecnologia e baseadas na internet, ao contrário das incubadoras tradicionais que objetivam a criação de empregos como impacto principal. Além disso sugerem que as incubadoras não devem ser tratadas como operações autônomas, mas sim integradas a uma rede de atores-chave para promover inovação, competitividade, transferência de tecnologia e outros objetivos-chave de políticas públicas (RYZHONKOV, 2013). A Figura 20 demonstram o esquema deste modelo.

Figura 20 - Figura-conceito do modelo para incubadoras da nova economia.

Fonte: Adaptado de Ryzhonkov (2013).

O modelo NBIA foi desenvolvido em 2002 pelos pesquisadores Costa-David, Malan e Lalkaka e é um dos modelos mais referenciado nos Estados Unidos e Europa, sendo apresentado em estudo de benchmarking europeus. Este modelo misto (estrutural e de processos) provê a compreensão de quais práticas são usadas para transformar entradas em saídas dentro do processo de incubação. A Figura 21 demonstra a figura conceitual deste guia desenvolvido para os países europeus estabelecerem incubadoras de empresas.

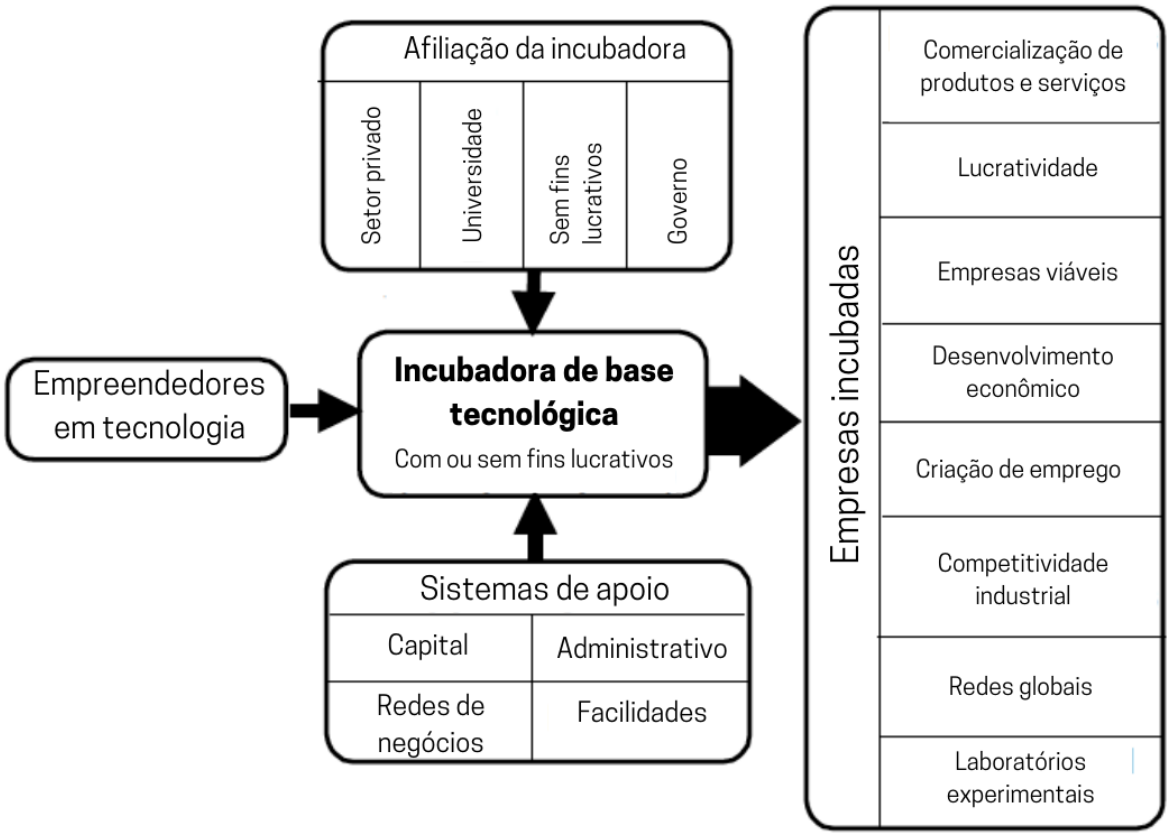
Figura 21 - Figura-conceito do modelo NBIA.



Fonte: Guillen e Veras (2018).

Um modelo estrutural de incubadora de base tecnológica (Figura 22) foi proposto em 2003 por Wiggins e Gibson, sendo uma extensão do modelo Smilor (1987), através da análise de incubadoras de base tecnológica americanas. O modelo observa que incubadoras de empresas são “caixas pretas” que transformam entradas em saídas através da agregação de valor. Eles argumentam que capital financeiro e redes de conhecimento são mais ativos mais valiosos do que serviços de secretariado e mera expertise de negócios.

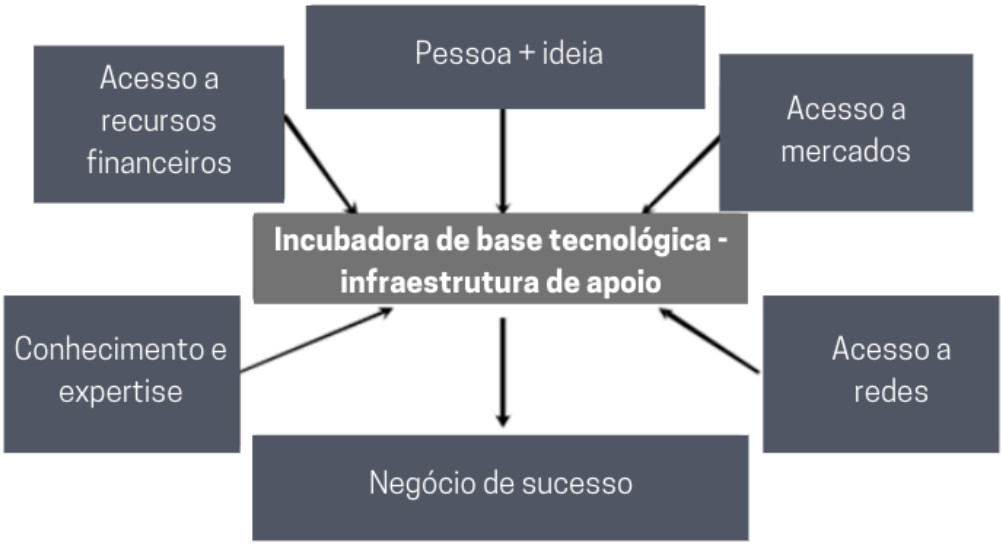
Figura 22 - Figura-conceito do modelo Wiggins e Gibson (2003).



Fonte: Adaptado de Ryzhonkov (2013).

Sahay (2003) pretendia demonstrar os principais ativos de uma incubadora de negócios, propondo um modelo estrutural (Figura 23), validando o principal objetivo das incubadoras de transformar pessoas com ideias em empreendedores detentores de um negócio bem sucedido.

Figura 23 - Figura-conceito do modelo Sahay (2003).



Fonte: Adaptado de Ryzhonkov (2013).

No mesmo ano, baseados no modelo de Campbell et al. (1985), Hackett e Dilts apresentaram os principais *inputs* e resultados do processo de incubação, considerando que as incubadoras são facilitadoras da geração de tecnologias. O modelo observa que o desempenho da incubação depende do desempenho de seleção, intensidade e monitoramento de ativos de apoio aos negócios e da abundância de recursos (RYZHONKOV, 2013; HACKETT; DILTS, 2004a). O Quadro 2 demonstra a lógica do referido modelo.

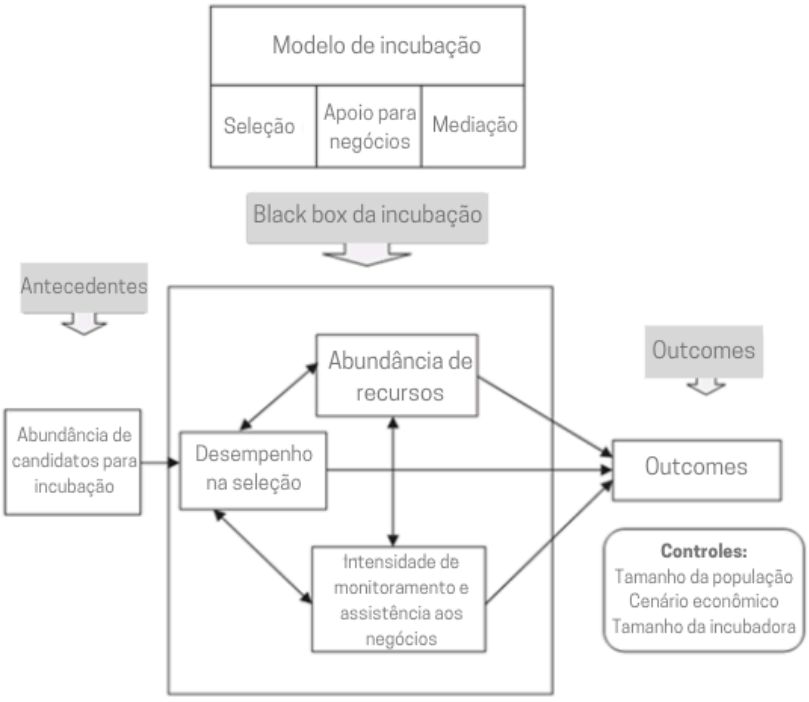
Quadro 2 - Modelo proposto por Hackett e Dilts (2004).

Antecedentes	*Inputs*	Atividades	*Outputs*	*Outcomes* iniciais	*Outcomes* intermediários	*Outcomes* a longo prazo
Início das atividades	Empreendedores	Incubação: desenvolvimento de um novo negócio + desenvolvimento de um novo produto + seleção + monitoramento e assistência ao negócio + abundância de recursos		Incubado está sobrevivendo e crescendo rentavelmente		Aumento da rotatividade da população na organização
Apoio da comunidade para o empreendedorismo	Viabilizando tecnologias e inovações		Empresas incubadas	Incubado está sobrevivendo e crescendo, mas não ainda lucrando	Empresas viáveis ou se tornando viáveis	
Condução de pesquisas básicas externas	Inovações e tecnologias críticas			Incubado está sobrevivendo, mas não crescendo e não tem lucratividade	Empresas falindo	
Eventos de orientação a empreendedores individuais	Inovações e tecnologias estratégicas			As operações do incubado terminaram na incubadora e apresenta perda financeira, ainda que mínima		
Estudo de viabilidade da incubadora				As operações do incubado terminaram na incubadora e está tendo grandes perdas financeiras		

Fonte: Adaptado de Hackett e Dilts (2004a).

Ainda no mesmo ano, o Modelo Soetanto foi apresentado como um modelo de processo para explicar os processos chave no processo produtivo de uma incubadora (HACKETT; DILTS, 2004b). A teoria defende que o desempenho do processo de incubação depende da habilidade da incubadora de criar oportunidades. A Figura 24 demonstra o esquema da teoria.

Figura 24 - Esquema do modelo Soetanto.

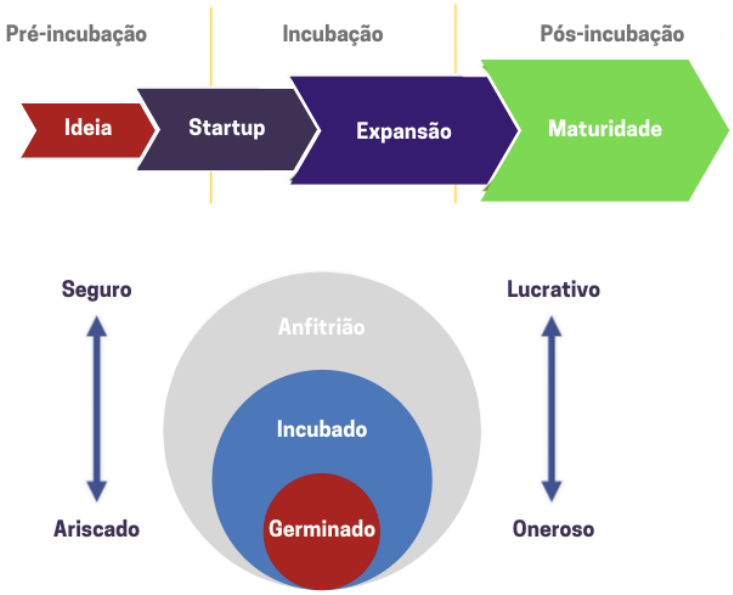


Fonte: Adaptado de Ryzhonkov (2013).

Em 2008, Bergek e Norman desenvolveram um modelo de processo que não foca apenas nos resultados. Ainda seja baseado no modelo de Hackett e Dilts (2004a), este modelo apresenta diferentes pontos de vista. De acordo com Bergek e Norman (2008), a seleção é uma das tarefas principais, devendo os critérios de seleção serem ajustados às características e objetivos da incubadora. O modelo propõe duas abordagens de seleção: baseada em ideia de negócios e baseada no empreendedor.

O Banco Mundial (World Bank, 2009) criaram o InfoDev, um programa de promoção à inovação focado em cinco áreas: acesso a recursos financeiros, agronegócios, mudanças climáticas, inovação móvel e mulheres empreendedoras. Dentro do programa há a proposição de um modelo de processo (Figura 25) que relaciona o processo de incubação ao ciclo de vida dos negócios. Neste modelo o empreendedor passa por quatro estágios: ideia, startup, expansão e maturidade. A incubadora propõe três dos principais estágios e um pequeno pré-estágio: germinação, pré-incubação, incubação e pós-incubação.

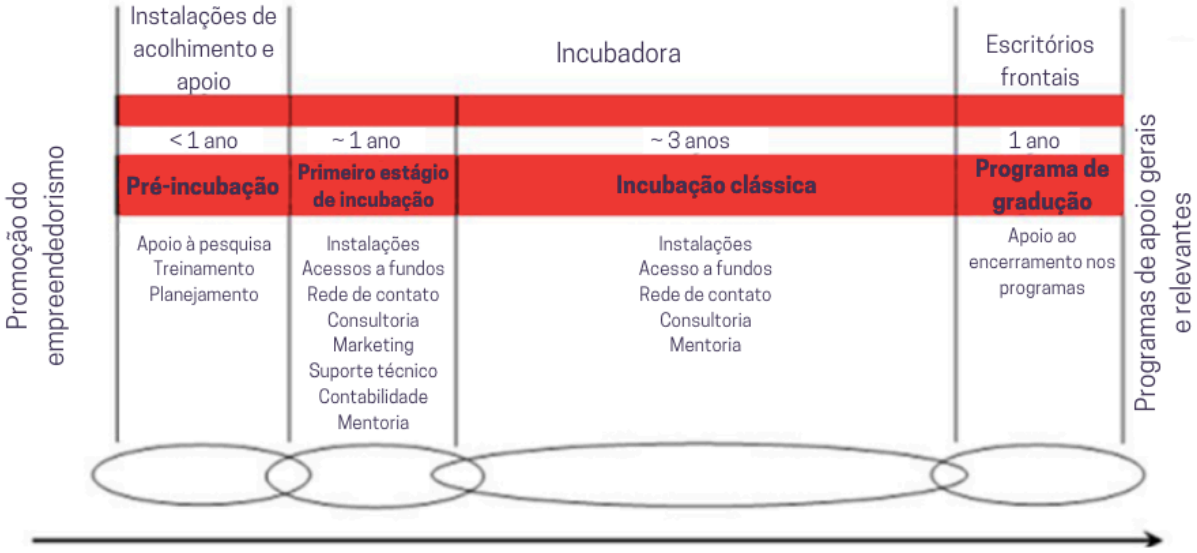
Figura 25 - Esquema do modelo InfoDev.



Fonte: Adaptado de Ryzhonkov (2013).

Jones (2010) propôs um modelo da cadeia de valor da incubação, sendo o primeiro modelo de abordagem compreensiva que relaciona o processo de incubação aos processos do ecossistema de inovação e do ciclo de vida do empreendedor. Jones considera que a incubadora de empresas é parte de uma cadeia de valor que nos permite refletir sobre os objetivos a longo prazo do sistema de inovação como um todo. Este modelo relaciona tempo e práticas que a incubadora adota para direcionar os negócios ao longo de seus ciclos de vida, assim como demonstra a Figura 26.

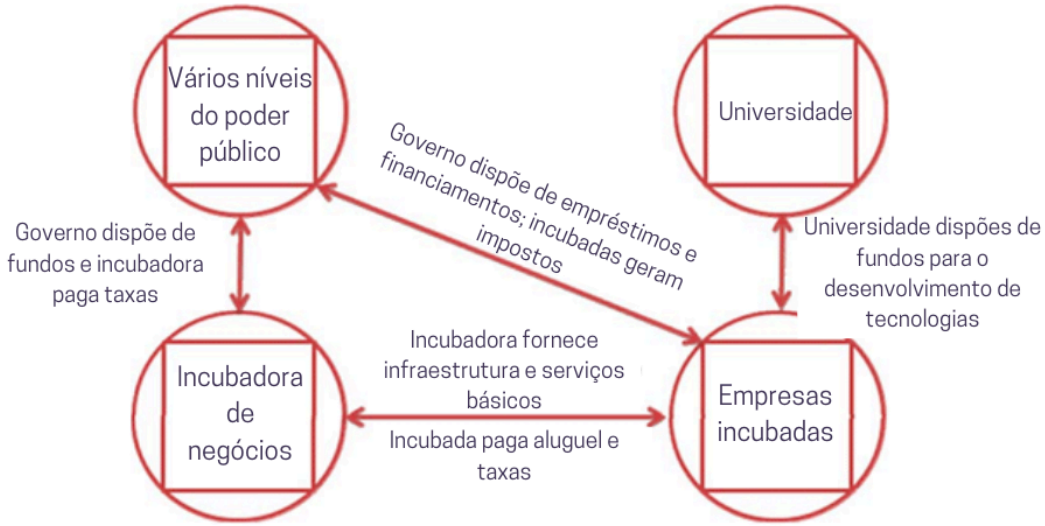
Figura 26 - Esquema do modelo de Jones (2010).



Fonte: Adaptado de Jones (2010).

Chandra e Chao (2011) demonstraram o fluxo (ciclo) de recursos (dinheiro e tecnologia) entre os principais stakeholders de um ecossistema de inovação, através de um modelo processual de incubação. Os autores apresentam quatro principais atores dentro do processo: poder público/governo, incubadora de negócios, empreendedores e universidades. Os apoios à incubação por parte do poder público tem a expectativa de crescimento econômico e a criação de empregos (incubadora tradicional), a universidade por sua vez espera a transferência de tecnologia e sua comercialização. Para tanto, o governo prove investimentos e empréstimos, no intuído da geração de impostos após a consolidação do negocio. As universidades patrocinam o desenvolvimento de tecnologias e conhecimento. Neste contexto, as incubadoras são tidas como mediadores destes recursos. A Figura 27 demonstra o ciclo de recursos proposto por Chandra e Chao.

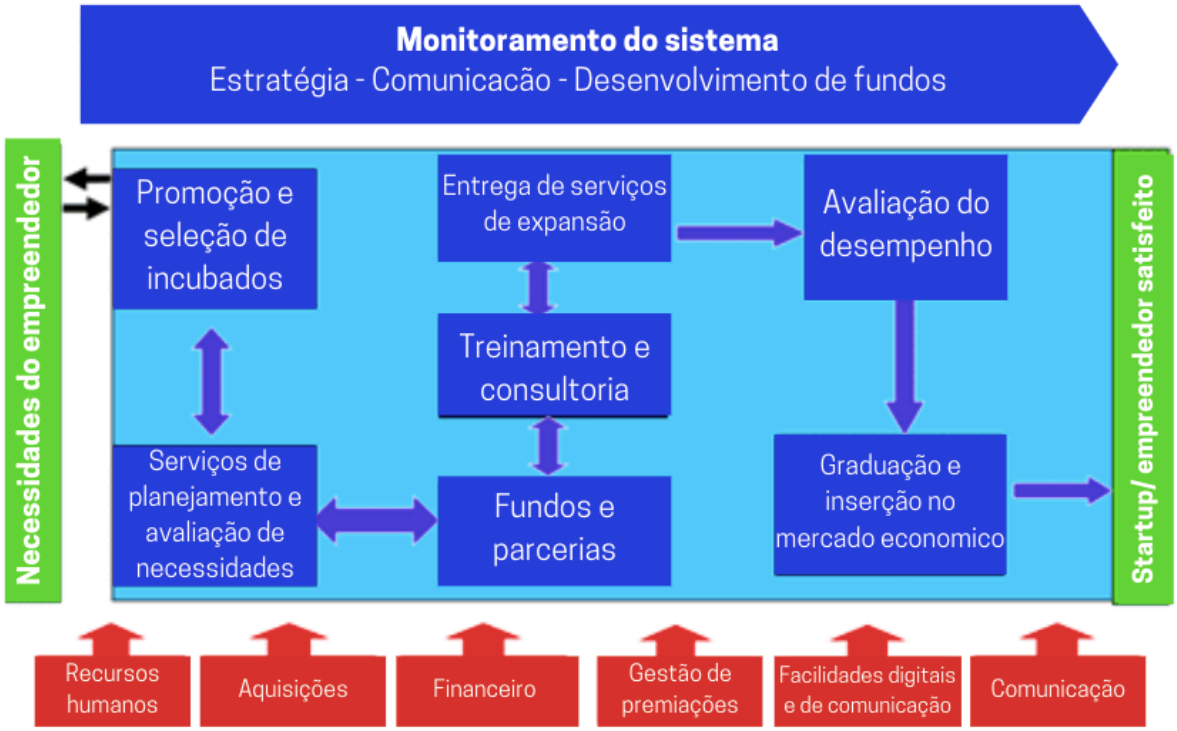
Figura 27 - Modelo de incubação e ambiente externo de Chandra e Chao (2011).



Fonte: Adaptado de Ryzhonkov (2013).

Em 2012, Metibtikar mapeou os processos de uma incubadora, propondo um modelo de processo de incubação. O modelo (Figura 28) aborda diversos aspectos construtivos: necessidades do empreendedor, processo de incubação, processos de monitoramento e mediação, serviços de apoio e ciclo PDCA (Plan – Do – Check – Act). Cada prática ofertada pela na cadeia de valor da incubação está sujeita a um melhoramento contínuo. No Brasil, o Instituto Genesis do Rio de Janeiro (PUC-Rio) utiliza um modelo de gestão baseado no principio de melhoramento contínuo. O modelo é composto por cinco etapas: planejamento, execução, monitoramento e controle, ação corretiva e informação (ARANHA, 2002).

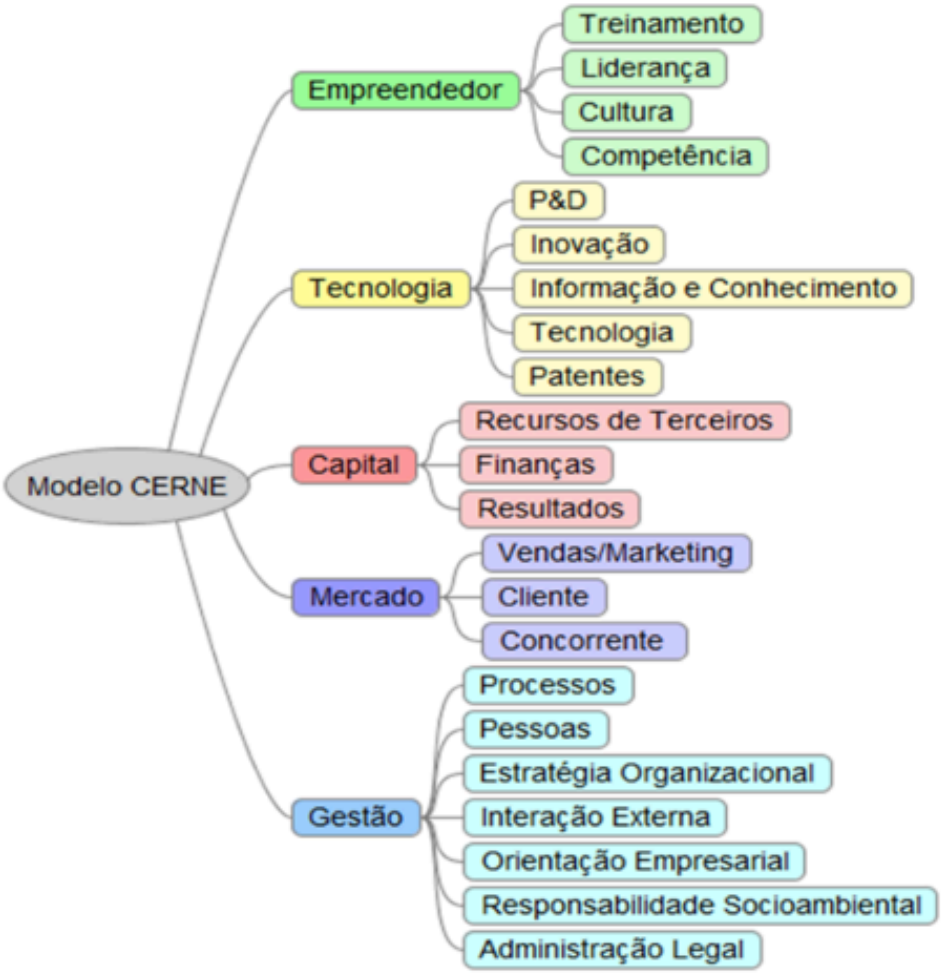
Figura 28 - Modelo de incubação Metibtikar em 2012.



Fonte: Adaptado de Ryzhonkov (2013).

A nível nacional, a ANPROTEC em parceria com o SEBRAE propôs um modelo nacional para incubação chamado de Modelo CERNE. Este modelo utiliza a metodologia para identificar sistemas, elementos e práticas chave que uma incubadora deve implementar para gerar negócios de sucesso (ANPROTEC, 2018). O modelo propõe que a incubadora deve atuar em três áreas independentes: desenvolvimento (foco nas práticas que auxiliam o desenvolvimento de produtos, serviços e tecnologias, acesso a capital, acesso a mercados, gestão eficiente e desenvolvimento pessoal do empreendedor), processo (foco nos processos que permitem a transformação de ideias em empresas) e incubadora (foco na gestão da incubadora como uma empresa, relacionando pessoas, finanças e relação com as demais incubadoras). O modelo CERNE apresenta cinco dimensões (Figura 29), com o objetivo de fortalecer as incubadoras de empresas e estimular o desenvolvimento de empreendimentos de sucesso (ALMEIDA et al., 2015). Os quatro níveis de maturidade de uma incubadora podem ser observados e compreendidos no Quadro 3.

Figura 29 - Dimensões do modelo CERNE.



Fonte: Almeida et al. (2015).

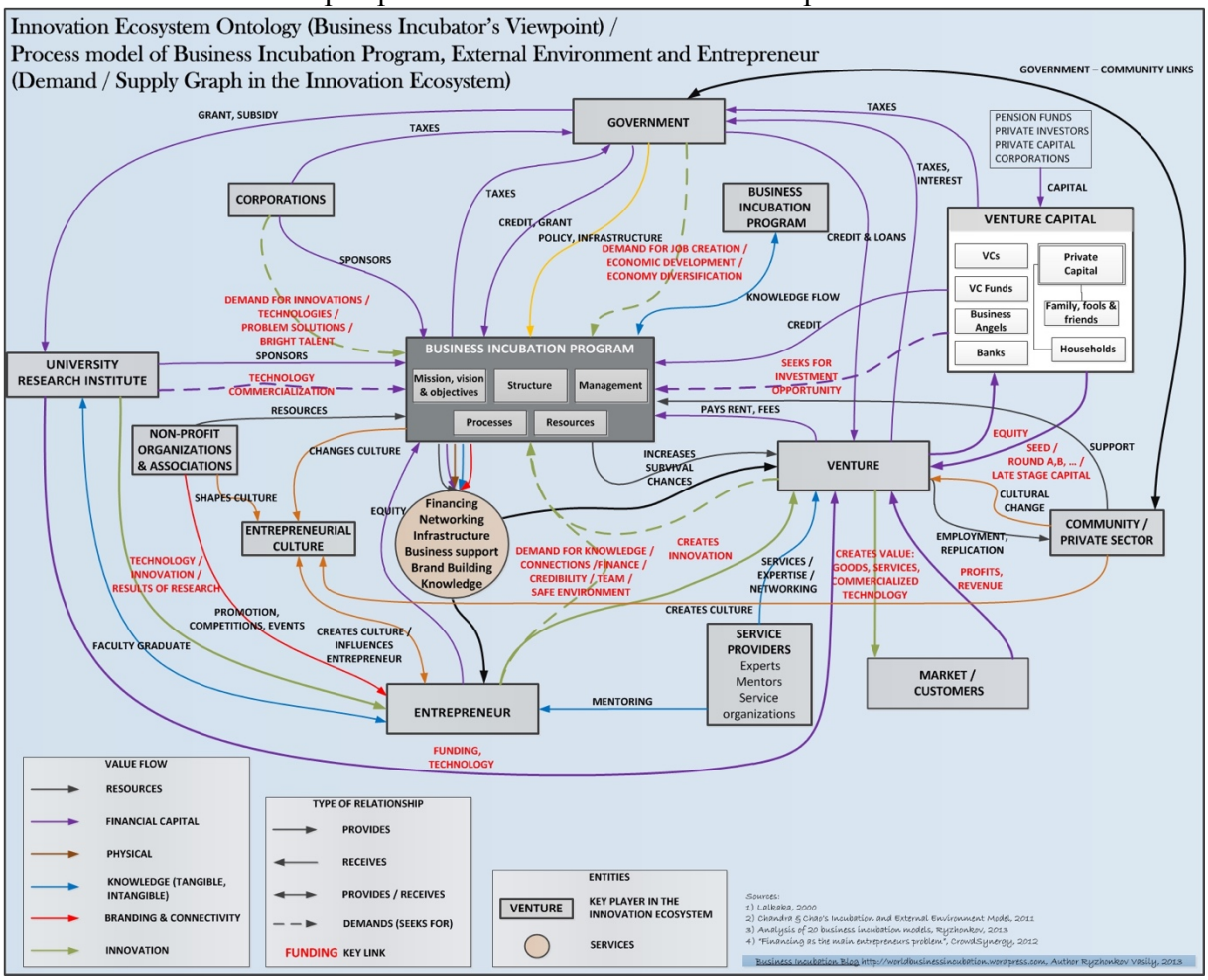
Quadro 3 - Modelo CERNE

EMPREENDIMENTO (CERNE 1)	**INCUBADORA** (CERNE 2)	**REDE DE PARCEIROS** (CERNE 3)	**MELHORIA CONTÍNUA** (CERNE 4)
- Sistema de sensibilização e prospecção; - Sistema de seleção; - Sistema de planejamento; - Sistema de capacitação; - Sistema de assessoria; - Sistema de acompanhamento e avaliação; - Sistema de apoio à graduação de projetos futuros - Sistema de gerenciamento básico	- Sistema de avaliação e certificação; - Sistema de geração de ideias; - Sistema de gestão estratégica; - Sistema de serviços e empreendimentos	- Sistema de apoio ampliado aos empreendimentos; - Sistema de monitoramento do desempenho da incubadora; - Sistema de participação no desenvolvimento regional sustentável.	- Sistema de melhoria contínua

Fonte: Adaptado de Almeida et al. (2015).

A partir da análise dos diversos modelos de processo e estruturais de incubadoras de empresas, Ryzhonkov (2013) propôs um modelo de processo do ambiente externo, programa de incubação e empreendedores em um ecossistema de inovação. Este modelo demonstra os objetivos dos stakeholders com o processo de incubação, tendo a incubadora como centro do esquema (Figura 30). O autor enfatiza que o sucesso de uma incubadora depende da sua capacidade de encontrar as necessidades e demandas oriundas do poder público, corporações, investidores e comunidade.

Figura 30 - Figura-conceito do modelo ontológico de um ecossistema de inovação, sob a perspectiva de uma incubadora de empresas



Fonte: Adaptado de Ryzhonkov (2013).

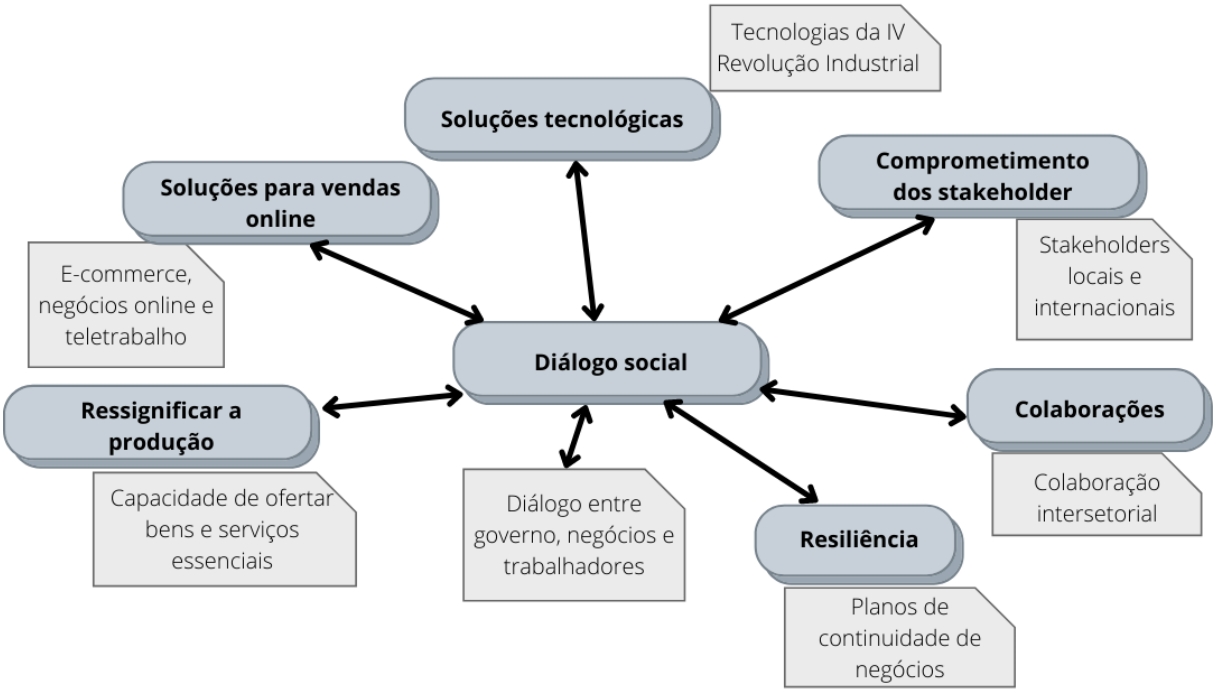
Recentemente a pandemia da COVID-19 modificou cenários globais e a humanidade passa por uma das maiores transformações seja no estilo de vida, seja economicamente, ambientalmente e socialmente, seja em novas tecnologias. No que tange o empreendedorismo, alguns autores apresentam desafios causados por esta pandemia, tais como: aumento do custo; recessão econômica e dívidas (MCKIBBIN; FERNANDO, 2020); falência de negócios;

interrupções de demandas e suprimentos (LOSE; KAPONDORO, 2020); comprometimento da viabilidade financeira (RAJAGOPAL et al., 2020); disrupção de cadeias de valor (BASNAYAKE et al., 2020); dentre outras.

As incubadoras de empresas também estão sendo afetadas, impulsionando a uma reavaliação e reformulação de seus modelos operacionais e de negócios, a fim de manter sua viabilidade (LOSE; KAPONDORO, 2020). Lose et al. (2020) destacam que o desastre causado pela COVID-19 tem criado um novo modo de operação para as incubadoras de empresas.

Lose e Kapondoro (2020) investigaram as competências necessárias para que as incubadoras de empresas tenham sucesso ao responder às disrupções causadas por esta pandemia e a quarta revolução industrial. Eles destacam que adaptabilidade, rede de contatos e capacidade de inovação tecnológica são competências essenciais para as incubadoras no pós-Covid. Diante do exposto, Lose et al. (2020) propuseram uma teoria de incubação de negócios pos-Covid, demonstrando que elementos chave a serem considerados no período pós-pandêmico incluem diálogos sociais, resignificar as operações dos negócios, soluções tecnológicas, comprometimento dos stakeholders e colaboração para fomentar a resiliência. A Figura 31 demonstra o modelo proposto para incubadoras de negócios para o período pós-pandemia.

Figura 31- Diagrama dos fatores remodelantes de incubação de negócios no pós-Covid.



Fonte: Adaptado de Lose et al. (2020).

2.4.1.2 Incubadoras universitárias e a Agenda 2030

Scaramuzzi (2002) afirma que as incubadoras de empresas universitárias desempenham um papel de conector entre pesquisa, tecnologia, capital e conhecimento a fim de catalisar o desenvolvimento de novos negócios. Este tipo de incubadora gerenciada, mantida ou apoiada por universidades surgiu na década de 50 em Nova Iorque, vinculadas a parques tecnológicos, e começou a se popularizar no final da década de 70, levando as pesquisas desenvolvidas em universidades para o setor produtivo (AZEVEDO et al. 2016). A primeira incubadora universitária foi estabelecida no Brasil nos anos 80, sendo que na década de 90 já haviam cerca de 100 (STAL et al., 2016). Este movimento foi alavancado pela transformação da universidade de pesquisa para a universidade empreendedora (ETZKOWITIZ, 2003).

A maior parcela de incubadoras vinculadas a universidades apresenta um viés de base tecnológico (MEDEIROS et al., 1992; AZEVEDO et al., 2016), bem como as incubadoras de tecnologia devem ter o envolvimento ativo de uma ou mais universidades locais. De fato, é prática comum que as incubadoras de tecnologia mantenham vínculos estreitos com as universidades e centros de pesquisa, quando não são promovidas diretamente pelas IES e/ou estabelecidas nos campi universitários (DORNELAS, 2002; OECD, 2010).

A quíntupla hélice focaliza a universidade como fonte de empreendedorismo, tecnologia e inovação, visto que a dispersão do conhecimento ocorre através do processo de transferência de tecnologia, o qual converte pesquisa desenvolvida na universidade em inovação tecnológica a ser aplicada por negócios, trazendo benefícios para ambos os atores e configurando-se como um importante condutor para a inovação e criação do desenvolvimento sustentável (ETZKOWITZ; ZHOU, 2017; CARAYANNIS; CAMPBELL, 2010).

Incubadoras de empresas de base tecnológica, uma variante da incubação de empresas mais tradicionais, são organizações que abrigam empresas cujos produtos, processos ou serviços resultam de pesquisa científica, para as quais a tecnologia representa alto valor agregado e que demandam conhecimento intensivo em ciência e tecnologia (BIZZOTTO, 2003; OECD, 2010). Estas incubadoras, auxiliam os empreendedores orientados para a tecnologia na fase de *startup* e desenvolvimento inicial de suas empresas, que buscam alto nível de inovação, bem como a difusão do conhecimento e da inovação, fornecendo espaço de trabalho (em condições preferenciais e flexíveis), instalações compartilhadas e uma gama de serviços de suporte ao negócio (DORNELAS, 2002; OECD, 2010).

Com relação às empresas abordadas por um programa de incubação de tecnologia, OECD (2010) aponta, no geral, as características que estas devem ter: i) orientadas para a tecnologia; ii) potencial de crescer em um período de tempo relativamente curto e empregar

trabalhadores qualificados; iii) envolver estreitamente graduados, na sua gestão. Estas características devem ser consideradas, visto que, além dos propósitos gerais das incubadoras tradicionais, as incubadoras de tecnologia apresentam os seguintes objetivos específicos (OECD, 2010):

a) Fortalecer o componente de conhecimento da economia local, também envolvendo mais perto o sistema universitário com os negócios;
b) Criar um ambiente propício ao empreendedorismo tecnológico, que, por sua vez, contribui para a competitividade econômica local;
c) Fornecer um viveiro para a comercialização de pesquisas universitárias, especialmente quando as instituições de ensino superior estão diretamente envolvidas na promoção e gestão da incubadora;
d) Promover o desenvolvimento de tecnologias de fertilização cruzada, como biotecnologias, nanotecnologias ou ciências dos materiais, que tem aplicações industriais possíveis;
e) Apoiar o surgimento de *startups* de elevado potencial que possam alcançar progressos significativos no emprego, nas vendas e nas exportações.

O desenvolvimento de tecnologias vem avançando em um ritmo acelerado, podendo-se empreender negócios inovadores por meio de tecnologias digitais amplamente disponíveis, a baixo custo e com número crescente de investidores (ICE, 2019). Mundialmente, as incubadoras de tecnologia representam uma parcela crescente dos programas de incubação de empresas existentes (OECD, 2010). Ainda é um desafio para o ecossistema de inovação brasileiro integrar a academia com novos negócios. As universidades, através de suas incubadoras e escritórios de transferência de tecnologia, podem promover o desenvolvimento inovador em uma determinada região (ETZKOWITZ; ZHOU, 2017), sendo a tecnologia um importante potencializador desses negócios.

Existe um interesse global em apoiar startups, visando estimular o crescimento e a capacidade criativa e inovadora dessas empresas. Estas empresas têm despertado a atenção em várias áreas do conhecimento devido ao espaço e visibilidade que elas tem adquirido, e principalmente, devido à participação delas no crescimento econômico e tecnológico nas regiões onde estão localizadas. Entretanto, estas não são empresas isoladas, elas vivem e necessitam de um ecossistema que inclui outras startups, universidades, investidores, incubadoras, entre outros elementos, sendo cada vez mais necessários apoio e incentivo ao

empreendedorismo tecnológico e de inovação a fim de fomentar esses novos modelos de negócios (TORRES; SOUZA, 2016).

As denominadas *Startups* são organizações focadas na inovação de produtos ou serviços, ou seja, ideias comerciais inovadoras, estando sob riscos constantes até alcançar um modelo de negócios replicável, escalável, profícuo, palpável e de crescimento (BLANK; DORF, 2012; TORRES; SOUZA, 2016; SIQUEIRA et al., 2022). De acordo com Siqueira et al. (2022), a palavra deriva da expressão em inglês "*to start up*" – operar algo, iniciar uma nova empresa, organização ou atividade. Seu modelo de negócios inicial é um *canvas* preenchido de ideias e questionamentos, mas não tem clientes ou conhecimentos sobre o potencial cliente (BLANK; DORF, 2012). Uma *startup,* por definição, é uma catalisadora que transforma ideias em produtos, constituindo-se de uma empresa nascente que está à procura de mercado para seu produto inovador, inseridas em um contexto de incertezas (TORRES; SOUZA, 2016). Esse tipo de empresa ou instituição se constrói nos mais diversos ramos e surge espontaneamente, tendo como essência a inovação para criar produtos e serviços os quais pretendem revolucionar o mercado (RIES, 2012).

Não é atípico que, para as *startups,* as preocupações ligadas à viabilização e sobrevivência do negócio mostram-se mais urgente e prioritárias do que as relacionadas à sustentabilidade, sendo que o olhar do empreendedor, mesmo aquele que possui um discurso de empresa preocupada com questões socioambientais, é norteado pela sustentabilidade econômica do negócio. Concomitantemente, observando os objetivos específicos das incubadoras de empresas é possível perceber que estas atualmente dão ênfase à formação em gestão, não havendo iniciativas de estímulo para que os empreendedores incubados lidem com as questões de natureza social e ambiental no seu negócio (BRITO et al., 2014).

A Agenda 2030 reconhece que a Ciência, Tecnologia e Inovação são os principais condutores para alcançar as metas e objetivos propostos, sendo que inovações tecnológicas tem um papel crucial no desenvolvimento da historia do século 21 e é tida essencial para identificar necessidades emergentes, relacionando a natureza interconectada das questões temáticas e concebendo soluções para enfrentar os desafios e barreiras do desenvolvimento sustentável de um nível local para um nível global (UN 2016; WIPO, 2018; TU DELFT, 2018). Ao mesmo passo, um dos pontos que distinguem os ODS dos Objetivos do Milênio é expectativa do uso da tecnologia como meio de implementação de suas metas (GRI; UNGC, 2019), ratificando a necessidade latente de relacionar inovações tecnológicas com a elaboração de ações voltadas aos ODS, visto que fornecem conhecimentos essenciais para apoiar as transformações emergentes (TU DELFT, 2018; ICSU; ISSC, 2015).

Além do ODS 9 que explicitamente objetiva fomentar inovação sustentáveis (UN 2016), muitos dos ODS são dependentes do desenvolvimento e da difusão de tecnologias inovadoras, sendo meios e ferramentas para soluções criativas para o desenvolvimento de desafios e, sendo o coração do sistema, se relacionam com a maior parte dos ODS (TU DELFT, 2018) A Figura 32 demonstra as formas de relação das inovações tecnológicas com os ODS e o Quadro XX demonstra possíveis tecnologias desenvolvidas por startups que podem contribuir com cada um dos ODS.

Figura 32 - Relação dos ODS com as inovações tecnológicas.

Fonte: Elaborado pelo autor com base em WIPO (2018).

Quadro 4 - Exemplos de temáticas de inovação que podem ser desenvolvidas por startups para cada um dos ODS.

ODS	Temáticas de inovação	ODS	Temáticas de inovação
1 ERRADICAÇÃO DA POBREZA	Acesso eficiente ao crédito; Crowdsourcing e crowdlending; Rastreabiidade financeira (assistência humanitária)	10 REDUÇÃO DAS DESIGUALDADES	Inclusão financeira; Economia compartilhada
2 FOME ZERO E AGRICULTURA SUSTENTÁVEL	Sistemas de produção sustentáveis e rastreáveis de alimentos	11 CIDADES E COMUNIDADES SUSTENTÁVEIS	Smart cities; Decisões coletivas; Mercados entre pares
3 SAÚDE E BEM-ESTAR	Segurança de dados de pacientes; Crowdsourcing de sistemas de saúde	12 CONSUMO E PRODUÇÃO RESPONSÁVEIS	Rastreabilidade de processos de produção; Condições comerciais
4 EDUCAÇÃO DE QUALIDADE	Certificações e gravações educacionais; Novas abordagens de aprendizagem	13 AÇÃO CONTRA A MUDANÇA GLOBAL DO CLIMA	Responsabilidade e transparência para descarbonização

	Microcréditos Alfabetização em TICs Novas estruturas de governança		Tecnologias de despoluição
	Sistemas de gestão inteligentes utilizando IoT		Responsabilidade e transparência para ecossistemas terrestres
	Novas tecnologias em energia		Transparência de gastos públicos; Tomada de decisão democrática
	Novos modelos de governança e organizações econômicas; Tecnologias de segurança no trabalho		Cooperação e interação global e regional
	Rastreabilidade de cadeias de valor; Inovação aberta; SSCM		

Fonte: Elaborado pelo autor, baseado em Fraga-Lamas e Fernández-Caramés (2020).

O papel vital da ciência, tecnologia e inovação, incluindo tecnologias ambientais, podem auxiliar no desenvolvimento e na facilitação de esforços direcionados aos desafios globais, tais como esforços para erradicar a pobreza, alcançar segurança alimentar e nutrição, melhorar a agricultura, facilitar o acesso a energia e aumentar a eficiência energética, combater doenças, melhorar a educação, proteger o meio ambiente, acelerar o ritmo da diversificação e transformação econômica, melhorar a produtividade e a competitividade e apoiar o desenvolvimento sustentável e inclusivo, uma vez que simultaneamente pode criar inclusão social e sustentabilidade ambiental (UNIDO, 2016).

Uma nova geração de empreendedores, ajudada por novas tecnologias, tentará capturar tal nicho, aproveitando essa oportunidade para aumentar sua participação no mercado ou entrar em novos mercados (YOUSSEF et al., 2017). Os novos modelos de negócios de impacto oferecem congruência ideal entre os interesses próprios do setor privado e de politica de desenvolvimento em torno da agenda dos ODS, ofertando oportunidades para a inovação, crescimento e competitividade (ALIANÇA PELO IMPACTO, 2019). A união de desafios complexos e alto potencial de inovação é o caldo perfeito para impulsionar investimentos e negócios de impacto no Brasil (ICE, 2019).

Nada obstante, considerando que os intermediários de inovação não podem estar alheios aos Objetivos de Desenvolvimento Sustentável acordados entre as nações para 2030, as incubadoras devem também ser vistas como agentes promotores de negócios sustentáveis, inclusivos e de impacto, visto que a inovação tecnologia no setor privado é uma ferramenta importante e um pré-requisito para potencializar os negócios de impacto e atingir as 169 metas

ambiciosas que compõe coletivamente os 17 ODS (ICE, 2019; UNDP, 2014). Mesmo que a maioria das incubadoras universitárias não tem uma estrutura formal e direcionada para o desenvolvimento sustentável, elas tem um papel relevante para as evoluções neste campo (CARDOSO et al., 2008), uma vez que sustentabilidade e empreendedorismo requerem inovação (IONESCU et al., 2020).

Este pressuposto reforça a necessidade latente das incubadoras vinculadas a universidades assumirem um papel de ator catalisador, sendo fomentadoras e incentivadoras da inclusão de temas ligados ao desenvolvimento sustentável na agenda das considerações dos empresários, inclusive dos candidatos à incubação através de normas de avaliação e de critérios de seleção que considerem a viabilidade socioambiental do negócio, sendo este um fator determinante para sua aprovação (CARDOSO et al., 2008; DALMORO, 2009; BRITO et al., 2014).

2.4.2 Incubadoras orientadas para a sustentabilidade

De acordo com ICE (2019) e Bank et al. (2017), por mais que o movimento de surgimento das incubadoras é oriundo da década de 50, estas ainda sofrem fragilidades até hoje, visto que há uma crítica geral de que as incubadoras são apenas provedoras de espaço físico e não de apoio crítico para as startups em fase inicial de desenvolvimento. Para o Brasil, as incubadoras são uma fonte importante de desenvolvimento e de inovação. Apesar da significativa contribuição para o desenvolvimento das regiões e para o aumento da competitividade das empresas, observa-se que as incubadoras, especialmente as tecnológicas vinculadas a universidades, não podem se furtar de participar do processo de inserção da sustentabilidade, precisando sintonizar suas estruturas e serviços com as novas exigências da sociedade, revendo seus focos, processos e serviços no contexto da sustentabilidade econômica (viável), social (justa) e ambiental (correta) (BRITO et al., 2014; BOMBARDI et al., 2018).

Esta transição está em fase inicial de construção, de forma que pouco se sabe de que forma as incubadoras estão assumindo esta tarefa, nem como os empreendedores vêm incorporando os princípios de sustentabilidade em seus projetos empresariais neste espaço (FONSECA; JABBOUR, 2012; BRITO et al., 2014). Porém ainda é notável que a questão de sustentabilidade socioambiental está longe de ser uma preocupação dos coordenadores das incubadoras e sequer parece ser objetivo de inquietação ou de alguma medida a ser tomada a curto ou médio prazo. Se este comportamento tem implicações negativas para as futuras gerações de empreendedores, pode reverter caso haja vontade política e medidas institucionais

nas instituições de ensino superior que alavanquem sustentabilidade em novos negócios (BRITO et al., 2014).

O processo de incubação denota uma intervenção positiva para nutrir as startups e pequenas e médias empresas a envolver fatores de desenvolvimento econômico e social (HERNÁNDEZ; CARRÀ, 2016). No Brasil, há um movimento das incubadoras tecnológicas para este caminho, fomentado pelo Programa de Incubação e Aceleração de Impacto promovido através de uma parceria entre Associação Nacional de Entidades Promotoras de Empreendimentos Inovadores (ANPROTEC), Serviço Brasileiro de Apoio a Micro e Pequenas Empresas (SEBRAE) e Inovação em Cidadania Empresarial (ICE), o qual tem por objetivo mobilizar aceleradoras e incubadoras a desenharem estratégias para atrair, selecionar e acompanhar a estruturação de Negócios de Impacto em seu portfólio. O programa parte da premissa de que incubadoras e aceleradoras têm um enorme potencial de influenciar a agenda empreendedora do Brasil, disseminando o conceito de negócios de impacto em escala nacional, e contribuindo para que mais soluções para a resolução de problemas sociais surjam e se fortaleçam (ANPROTEC, 2019).

De acordo com a ANPROTEC (2018), a Força Tarefa de Finanças Sociais lançou, junto com outras 14 recomendações, que para o campo de empreendimento sustentável e de impacto avançar no Brasil, uma meta de que ao menos 10% das incubadoras estejam atuando estrategicamente para fomentar e apoiar negócios de impacto, com um percentual relevante – acima de 20% - de seu portfólio neste segmento, bem como utilizando indicadores para medir impacto de suas atividades.

Estas organizações devem atuar diretamente e/ou sistematicamente com os empreendedores para promover um ambiente oportuno de criação e fortalecimento dos negócios com intencionalidade de impacto, disseminando o conceito de negócios de impacto em escala nacional e contribuindo para termos mais soluções para a resolução de problemas socioambientais (DELOITTE, 2015; BOMBARDI et al., 2018). As empresas são estimuladas e estimulam a descoberta de novos nichos de mercado, os nichos verdes, buscando atendê-los com novos serviços e produtos (CARDOSO et al., 2008).

Os desafios em atender objetivos socioambientais em negócios incubados se referem a questões de dificuldade de adesão do mercado ao produto, à falta de consciência e interesse no investimento ou no consumo de produtos e serviços socioambientais, seja por parte da população de modo geral, seja por parte de investidores e empresas, ou seja, desafios de natureza cultural, da mentalidade do mercado, para os quais tem pouca resposta (BRITO et al., 2014).

Além de oferecer um programa qualificado de incubação que esteja ancorado nos princípios do desenvolvimento sustentável, as incubadoras devem ter em sua essência a orientação para a sustentabilidade (BOMBARDI et al., 2018). As incubadoras devem ter instrumentos a sua disposição para auxiliar nos seus processos de gestão internos, conquanto há uma lacuna de propostas para avaliar estes aspectos ou até mesmo de discussões preliminares sobre as relações entre as incubadoras e o meio ambiente (FONSECA; JABBOUR, 2012; HERNÁNDEZ; CARRÀ, 2016). O atual modelo de negócios ofertados pelas incubadoras para as startups não abordam a empregabilidade da sustentabilidade e ESG. Novos modelos devem trazer princípios dos ODS, considerando que empreendimentos que não priorizam a responsabilidade socioambiental e de governança sustentável terão cada vez mais seu espaço limitado em um cenário mercadológico pós pandemia (SIQUEIRA et al., 2022).

2.5 FIGURA-CONCEITO DA TESE

Diante do exposto do referencial teórico, um modelo adequado torna as incubadoras mais fortalecidas e qualificadas para catalisar os impactos socioambientais das startups incubadas, o que pode auxiliar na conquista de mais recursos para financiar as operações dos negócios (ESG) e realizar sua missão com sustentabilidade financeira garantida.

Analisando as abordagens presentes no referencial teórico no que tange a quíntupla hélice da inovação, a sustentabilidade, o empreendedorismo e ecossistemas de inovação através dos ambientes de fomento, foi possível realizar recortes de aprofundamento das temáticas, desenvolvendo a figura-conceito do estudo (Figura 33).

Figura 33 - Figura-conceito da tese.

Fonte: Elaborado pela autora baseado em Chais (2019).

Observando a Figura 33, identifica-se que o escopo teórico da tese consiste na abordagem da sustentabilidade, o nexo com as dimensões do Triple Botton Line (social, ambiental e econômico), os Objetivos de Desenvolvimento Sustentável propostos pela Agenda 2030 da ONU, a abordagem ESG e a geração de impactos positivos, dentro contexto da quíntupla hélice e ecossistemas de inovação, através de ambientes de inovação, as incubadoras de empresas e sob a viés do empreendedorismo sustentável, as *startups* como negócios de impacto. De acordo com Chais (2019), a representação proposta em círculos apresenta uma ideia de movimento, que efetivamente traduz em evolução, conectando a questão de pesquisa e englobando o que foi proposto teoricamente.

3. METODOLOGIA

3.1. ESCOPO DA PESQUISA

O escopo e foco da pesquisa são incubadoras vinculadas a universidades a nível nacional e internacional. Poucas incubadoras de empresas brasileiras já são mundialmente reconhecidas, porém o Brasil está se posicionando como referência internacional no que tange empreendedorismo de impacto, considerando a estratégia política nacional denominada ENIMPACTO (ICE, 2019; BOMBARDI et al., 2018). Sendo assim, o cenário brasileiro será considerado no estudo.

Nada obstante, a Agenda 2030 é um instrumento consensuado pela maior parte das nações mundiais, instituindo objetivos e metas universalizadas que seguem a premissa de "não deixar ninguém para trás". Neste contexto, o âmbito internacional será compreendido no estudo, através do levantamento de incubadoras de empresas, que atendam as premissas determinadas para o estudo, ou seja, incubadoras vinculadas a universidades e que já estejam orientadas para a sustentabilidade ou estejam em processo de transição para incentivar negócios de impacto.

3.2. CLASSIFICAÇÃO DA PESQUISA

Esta pesquisa apresenta uma epistemologia construtiva, a qual Saccol (2009) afirma que é a forma acredita-se que o conhecimento seja construído, não havendo uma realidade pronta e desenvolvendo-se novos significados à medida que há interação e compartilhamento coletivo. A interpretação da realidade dos sujeitos de pesquisa para atingir os objetivos propostos, mantendo o criticismo necessário ao processo da pesquisa configura o um paradigma de pesquisa fenomenológico (FLICK, 2016), o qual configura este estudo.

A pesquisa por sua natureza constitui-se como aplicada por apresentar, como essência, o desenvolvimento e a aplicação de um modelo teórico para incubadoras orientadas para a sustentabilidade. Silva e Menezes (2005) caracterizam este tipo de pesquisa por gerar conhecimentos dirigidos à solução de problemas específicos, envolvendo verdades e interesses locais.

A abordagem da pesquisa será qualitativa e quantitativa. No processo de investigação científica não haverá restrição a resultados frutos de uma determinada abordagem, ignorando ou, até, vilificando as demais. As diferenças entre as duas abordagens podem ser observadas no Quadro 5.

Quadro 5 - Comparativo entre métodos qualitativos e quantitativos

Aspectos	**Qualitativo**	**Quantitativo**
Ponto de análise	Palavras	Números
Ponto de vista	Participantes	Pesquisador
Interação com a pesquisa	Pesquisador perto	Pesquisador longe
Tipo de teoria	Emergente	De teste
Estrutura	Desestruturada	Estruturada
Compreensão	Contextual	Generalizada
Tipo de dados	Dados ricos e profundos	Dados puros e confiáveis
Resultados	Significado	Comportamento
Abordagem	Tende a seguir uma abordagem indutiva	Tende a seguir uma abordagem dedutiva

Fonte: Adaptado de Yilmaz (2013).

De acordo com Denzin e Lincoln (2005) e Lakatos e Marconi (2010), a pesquisa qualitativa consiste em descrever e compreender a complexidade do ser humano e como as pessoas constroem o mundo a sua volta, uma vez representa formas de sentido que podem ser coletadas e analisadas de diferentes maneiras, oferecendo uma análise detalhada, rica em observações e avaliações da realidade exposta ao pesquisador e de dados de acesso secundário, o que faz com que o pesquisador tenha condições de desenvolver modelos, tipologias ou até mesmo teorias. Nesta tese, o aspecto qualitativo se configura pela realização de um *benchmarking* para compreensão dos modelos atuais das incubadoras, bem como seu inclinamento à promoção de negócios de impacto socioambiental, e da aplicação do modelo proposto em uma situação real, avaliando qualitativamente este processo.

A pesquisa quantitativa baseia-se na premissa que todo fenômeno pode ser explicado por indicadores reais que representam a verdade, a qual não esta sob controle da percepção humana, confirmando ou não uma hipótese. Neste tipo de pesquisa não há a qualquer tipo de influência ou conexão entre o pesquisador e a amostra responsiva (TRAN et al., 2019). A abordagem quantitativa na tese ocorre pontualmente na aplicação de um questionário online para avaliar o potencial das incubadoras a fomentar a sustentabilidade, realizando análises estatísticas simplificadas e descritivas dos dados resultantes. O uso de questionário é considerado um método adequado para obtenção de respostas a partir de uma amostra para se descobrir a incidência relativa das variáveis a serem estudadas (HAIR Jr. et al., 2019).

Com relação aos seus objetivos, a pesquisa constitui-se como descritiva e exploratória. A pesquisa exploratória é aquela que visa ampliar o conceito a respeito de um determinado fenômeno, por ser esse escasso ou pouco estudado, tornando o problema mais familiar, ou seja, explicito (GIL, 2009; DENZIN; LINCOLN, 2005). Sendo assim, por mais que a temática de

incubadoras de impacto seja latente e que nunca antes o conceito de desenvolvimento sustentável esteve tão em voga cientificamente, a interrelação destes dois aspectos ainda é uma situação pouco investigada, constituindo uma pesquisa exploratória. Conforme Gil (2009) e Denzin e Lincoln (2005), o planejamento deste tipo de pesquisa é flexível, podendo considerar os mais variados aspectos relativos ao fato estudado, tais como: questionário online, entrevistas com pessoas que tiveram experiências práticas ou familiaridade com o problema estudado e análise de exemplos ou casos que estimulem a compreensão do problema exposto.

Tendo em vista que esta pesquisa não estabelece uma hipótese pré-definida, sendo seus passos metodológicos determinados pela sua questão, bem como fará uso de questionário e observação sistemática, considera-se descritiva, tipo importante de pesquisa para a ciência, visto que a descrição é geralmente o primeiro e essencial passo para ir em direção à compreensão do fenômeno, objetivando como premissa a descrição das características de determinada população, de fatos e fenômenos de uma realidade ou, até mesmo, o estabelecimento de relações entre variáveis (VOLPATO, 2011; GIL, 2002; TRIVIÑOS, 2015). Este tipo de pesquisa exige do pesquisador um nível de entendimento sobre a realidade estudada em sua pesquisa, requerendo cuidado para a coleta dos dados, a fim de que seja possível refletir sobre aquele tema (TRIVIÑOS, 2015).

Dentro do paradigma fenomenológico, o escopo e foco da pesquisa são as incubadoras universitárias com viés de geração de impactos socioambientais e orientadas para a sustentabilidade, caracterizando a pesquisa, conforme procedimentos técnicos, como estudo de caso. Este é um método utilizado como estratégia de pesquisa para estudos exploratórios, que permite explicar alguma situação a partir da prática, explorando processos e comportamento, buscando esclarecer uma decisão ou um conjunto de decisões, o motivo pelo qual elas são tomadas, e como essas decisões foram implementadas e com quais resultados, o que confere à análise uma profundidade com viés de particularidade de caso estudado, não havendo a quantificação ou enumeração dos resultados e sim a descrição e classificação dos fenômenos e eventos (YIN, 1989; YIN, 2003; EISENHARDT, 1989; BONOMA, 1985).

Os estudos de caso podem ser únicos ou múltiplos, os quais são considerados mais robustos, permitindo a comparação entre os casos e trazendo evidências presentes nos casos ou até mesmo nas unidades de análise, devendo cada caso selecionado ser cuidadosamente trabalhado para que se seja possível predizer resultados similares ou contrastantes (YIN, 2015).

3.3. PROCESSO METODOLÓGICO

Modelos teóricos devem apresentar os seguintes princípios: propósito, embasamento teórico, ponto de vista, técnica de abstração e tipo de modelo (RYZHONKOV, 2013). Seguindo o objetivo geral do estudo, o propósito do modelo é uma visão holística de incubadoras de empresas vinculadas a universidades orientadas para a sustentabilidade. O embasamento teórico será atendido pelas etapas de caracterização do contexto e aprofundamento teórico e prático dos aspectos relacionados à sustentabilidade e incubadoras de empresas. O ponto de vista será a partir de gestores de incubadoras de empresas vinculadas a universidades consolidadas como ambientes intermediários de inovação. A técnica de abstração será White box (caixa branca), apresentado em formato de diagrama, desenvolvido a partir das concepções apresentadas pelos modelos de incubadora de negócios pré-existentes, adicionando novas variáveis e operações. O tipo de modelo será de desenvolvimento misto, ou seja, estrutural (demonstrando a arquitetura de um sistema) e de processo (demonstrando o desempenho dinâmico).

A sequência dos objetivos específicos elencados determina o procedimento metodológico em uma estrutura de etapas e fases. A Figura 17 demonstra o fluxo metodológico a ser desenvolvido a fim de atingir os objetivos da pesquisa, apresentando a segregação por macro etapas (exploratória, desenvolvimento e aplicação) e a descrição detalhada das fases que compreendem o contexto.

Figura 34 - Processo metodológico apresentando os objetivos de cada fase, as atividades, respectivas ferramentas e produto de cada uma macroetapa.

Fonte: Elaborado pela autora.

3.3.1 Etapa exploratória e descritiva

Esta macroetapa contempla os dois primeiros objetivos específicos da pesquisa, investigando e contextualizando o cenário nacional e internacional de incubação orientado para a sustentabilidade. As fases desta macroetapa abarcam processos exploratórios (levantamento do panorama atual, benchmarking avaliativo, questionário online e entrevistas semiestruturadas realizadas com especialistas de incubadoras). Por sua vez, na fase descritiva, realizar-se-á uma descrição dos resultados das entrevistas, por meio de mapas conceituais no que tange os fenômenos investigados.

Esta macroetapa está segregada nas etapas secundárias de caracterização do contexto de incubadoras de impacto, aprofundamento teórico contemplando o levantamento de bases teóricas, análise qualitativa do conteúdo, análise quantitativa de dados e conhecimento de aspectos fundamentais no que tange o campo de sustentabilidade como tema de foco de grupos de pesquisa através do *benchmarking* funcional, bem como aprofundamento prático, o qual

envolve pesquisa qualitativa nas incubadoras participantes. Estas fases estarão apresentadas na sequência, sendo melhor detalhadas em cada um dos artigos correspondentes.

3.3.1.1 Caracterização do contexto de incubadoras de impacto

Esta etapa vai ao encontro do atendimento do primeiro objetivo do estudo. A caracterização do contexto de incubadoras de impacto ocorreu, através de uma pesquisa de mapeamento e levantamento de dados em fontes primárias, em dois cenários: no Brasil e no âmbito global. Gil (2009) caracteriza este tipo de pesquisa como aquela que utiliza materiais que não receberam ainda um tratamento analítico ou que ainda podem ser reelaborados de acordo com os objetos da pesquisa.

Considerando que no mundo há uma estimativa de operação de 7 a 15 mil incubadoras de empresas (NIOS, 2022), para a seleção das incubadoras analisadas, adotou-se como critério as principais incubadoras gerenciadas ou associadas a universidades ao nível internacional e no cenário brasileiro, buscando-se informações junto ao UBI Global World Rankings de incubadoras e aceleradoras vinculadas a universidades e os ambientes de inovação participantes do Programa de Incubação e Aceleração de Impacto da ANPROTEC em parceria com o SEBRAE e ICE. As fontes documentais utilizadas para as análises foram informações nos websites oficiais das incubadoras, documentos oficiais, relatórios internos, formulários de candidatura, editais de seleção, notícias e vídeos institucionais.

A partir de domínios e princípios de sustentabilidade propostos por Adams (2017), Ben-Eli (2018) e Brito et al. (2018), realizou-se uma análise de conteúdo no que tange descrição das atividades de cada uma das 140 incubadoras de empresas listadas tanto no âmbito nacional (n=52) quanto no âmbito internacional (n=88), seus objetivos, valores, tipos de serviços ofertados, programas e startups incubadas ou graduadas. A revisão literária abordando incubadoras e negócios orientados para a sustentabilidade corroborou para a análise do conteúdo reunido. A sistematização da análise ocorreu via *software* ATLAS.ti®, seguindo os passos analíticos propostos por Yin (2003).

Além da análise quanto ao foco das incubadoras (econômico, social, ambiental ou orientado para a sustentabilidade), uma análise relacionando os *cases* de startups aos ODS foi realizada, a fim de identificar se os negócios estão alinhados ao caminho da sustentabilidade.

Como um dos principais instrumentos de um processo de incubação, a seleção das incubadoras orientadas para a sustentabilidade, por meio de seus requisitos, foi analisada. Os

requisitos de seleção foram categorizados conforme dimensões do Modelo CERNE e, a fim de corroborar com o alinhamento aos princípios de sustentabilidade, relacionados com os ODS e suas respectivas metas.

O detalhamento da metodologia encontra-se na seção específica de métodos do artigo 1 da tese, intitulado "*Sustainability as orientation in university-linked business incubators: fact or fiction?*".

3.3.1.2 Aprofundamento teórico e prático

Esta fase foi segregada em diferentes atividades que contemplam em algumas situações o aprofundamento teórico, em outras o aprofundamento prático ou até mesmo ambas as análises, como é o caso do benchmarking funcional. As atividades e suas respectivas ferramentas serão descritas abaixo. Observa-se que a etapa denominada "Pesquisa exploratória" esta detalhadamente apresentada neste capítulo visto que não corresponde diretamente a nenhum artigo científico da tese.

a) *Pesquisa exploratória:* a pesquisa qualitativa exploratória permitiu um aprofundamento tanto teórico quanto prático e teve como meio a realização de um *benchmarking* funcional de cooperação *in loco,* tendo como objeto de estudo uma universidade de referência internacional na temática abordada - sustentabilidade. *Benchmarking* é definido como um método didático de identificação de oportunidades e melhores práticas, podendo auxiliar em uma análise comparativa e ser um meio de atingimento de desempenho superior em um processo de aprimoramento e obtenção de resultados, bem como compreensão e aprendizagem a partir dos erros e dos acertos de terceiros, evitando a incidência dos mesmos erros (SPENDOLINI, 1994).

   A coleta de dados foi realizada através da participação de um grupo de pesquisa especialistas na temática sustentabilidade e Agenda 2030, onde a troca de dados e informações pode ser conduzida pessoalmente, coletando dados detalhados, gerando informações de maior qualidade e possibilitando a observação direta dos métodos, processos e práticas em ação (SPENDOLINI, 1994).

   O estudo de caso exploratório e descritivo na Hamburg University of Applied Sciences (HAW) ocorreu em um ambiente de rotina real, não sendo modificado

pelo pesquisador, sendo caracterizado como um estudo *ex post facto,* no qual não existe controle de variáveis pelo pesquisador e toda e qualquer influência sobre as variáveis deve ser evitada, de acordo com Cooper e Schindler (2003). Em pesquisas de abordagem qualitativa, a observação é fundamental (DENZIN; LINCOLN, 2008).

De acordo com Chais (2019), anotações e reflexões podem ser feitas por meio de um diário de campo, relatando as vivências do pesquisador e elementos considerados importantes para a pesquisa. Os relatos das experiências vividas foram analisados simultaneamente ao período de *benchmarking*.

MOLDAVSKA e WELO (2019) afirma que há pontos críticos para avaliar a sustentabilidade que são fundamentais para o desenvolvimento de um modelo. Ao longo dos anos, as universidades europeias e americanas, pautadas no conceito do modelo teórico da quíntupla hélice, modificaram sua missão e trabalham alinhadas às demandas da sociedade, no desenvolvimento de suas regiões no que tange o empreendedorismo e a inovação, e atualmente, juntamente com demais organizações, começam a discutir e pesquisar formas de avaliar os impactos de projetos, processos e produtos no atingimento dos 17 Objetivos do Desenvolvimento Sustentável (CARAYANNIS; CAMPBELL, 2010; MOLDAVSKA; WELO, 2019). Neste contexto, o desenvolvimento de um *benchmarking* funcional de cooperação em uma universidade no exterior foi fundamental e enriquecedor, se justificando pela interação com especialistas e partes interessadas na temática de sustentabilidade e especialmente ODS para viabilizar um modelo que atenda, de forma universal, o objetivo principal do estudo.

A Hamburg University of Applied Sciences (HAW) é uma célula germinativa para inovações em pesquisa e desenvolvimento, sendo seu metiê produzir novas ideias e criar soluções que funcionem na prática, uma tarefa importante e um fator decisivo para a viabilidade futura da cidade de Hamburgo e sendo premiada por projetos deste âmbito. A universidade é integrante e colabora no Innovation Contact Center de Hamburgo, uma instituição de conhecimento que atua na interface entre universidades, empresas e o setor público (HAW, 2019). O doutoramento no exterior, através do Programa Institucional de Doutorado Sanduíche no Exterior da

Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (PDSE/CAPES 2019), foi realizado no período de Agosto de 2019 a Agosto de 2020 no Research and Transfer Centre "Sustainability and Climate Change Management" da Fakultät Life Sciences que realiza, dentre outros, estudos e pesquisa (internacionais, regionais e locais), compilação de opiniões de especialistas, desenvolvimento de eventos e programas de treinamento, publicação de resultados de pesquisas acerca da sustentabilidade, mormente sobre a Agenda 2030 e seus ODS.

A partir da etapa de pesquisa exploratória dentro desta rede de pesquisadores e instituições de ensino, foram elaborados dois estudos quantitativos para embasamento da tese e atendimento aos objetivos específicos propostos. O primeiro estudo abordou as competências necessárias para a educação voltada à sustentabilidade, entendendo que este é um dos principais ativos de uma incubadora de empresas para a transformação de seus negócios germinados. O segundo estudo oportunizou questionar incubadoras vinculadas a universidades acerca de seu posicionamento e orientação de seus serviços para o fomento de inovações sustentáveis, a fim de compreender os principais fatores de contribuição de uma incubadora de negócios no contexto de sustentabilidade e fatores relevantes a serem inseridos no modelo proposto.

b) *Pesquisa quantitativa:* A partir da etapa de pesquisa exploratória dentro desta rede de pesquisadores e instituições de ensino, foram elaborados dois estudos quantitativos para embasamento da tese e atendimento aos objetivos específicos propostos. O primeiro estudo quantitativo abordou as competências necessárias para a educação voltada à sustentabilidade, entendendo que este é um dos principais ativos de uma incubadora de empresas para a transformação de seus negócios germinados. O segundo estudo quantitativo oportunizou questionar incubadoras vinculadas a universidades acerca de seu posicionamento e orientação de seus serviços para o fomento de inovações sustentáveis, a fim de compreender os principais fatores de contribuição de uma incubadora de negócios no contexto de sustentabilidade e fatores relevantes a serem inseridos no modelo proposto.

   Através de dois questionários *online* (Apêndices A e B) com perguntas fechadas e abertas, embasados na revisão bibliográfica e no *background* teórico desenvolvido

pela tese, bem como a participação de pesquisadores com expertise na área de inovação, sustentabilidade, educação e empreendedorismo de países como Alemanha, Brasil, Espanha, Estados Unidos, Índia, Malta, Polônia, Portugal e Sérvia, além da pesquisadora e candidata ao doutoramento. De acordo com Hair Jr. et al. (2019), a abordagem através de questionários é considerada um método adequado para obtenção de respostas a partir de uma amostra para se descobrir a incidência relativa das variáveis a serem estudadas.

Os questionários foram estruturados através da plataforma *Google Forms.* A escolha desta plataforma considerou fatores de gratuidade, acessibilidade e popularidade da mesma (RAJU; HARINARAYANA, 2016; MOTA, 2019), bem como a familiaridade de possíveis respondentes a esta. Aspectos geográficos e físicos justificam a ferramenta *online*, uma vez que democratizam a participação de heterogênea e de um maior número de respondentes (RAJU; HARINARAYANA, 2016).

Através de redes de contato, realizou-se o convite para participação das pesquisas a partir de contato via e-mail em uma abordagem de "bola de neve" (Goodman, 1961). Parker et al. (2019) afirmam que esta abordagem é um dos métodos mais populares de amostragem em pesquisa qualitativa, sendo central as características de rede e referência. Os pesquisadores geralmente começam com um pequeno número de contatos iniciais (sementes) através de suas redes de relacionamento. Os contatados que atendem aos critérios de pesquisa podem participar como respondentes. Os respondentes são convidados a indicar outros contatos que se encaixam nos critérios da pesquisa, os quais podem recomendar outros participantes, em um movimento em bola de neve.

O detalhamento desta etapa metodológica está apresentado na seção de métodos dos artigos 2 e 3 da tese, intitulados "*University teaching staff and sustainable development: an assessment of competences*" (Anexo A) e "*The potential of university-led incubators in fostering sustainable development*".

c) *Pesquisa qualitativa:* esta fase trará um aprofundamento prático do contexto das incubadoras, tendo um caráter descritivo e exploratório por meio de estudos de multicasos. A pesquisa qualitativa preocupa-se com aspectos da realidade que não

podem ser quantificados ou enumerados e sim descritos e classificados, desenvolvendo uma tipologia ou teoria, através da compreensão de um fenômeno ou evento (BONOMA, 1985), podendo ser abordada de diversas formas, ou seja, pela análise de indivíduos, grupos, histórias bibliográficas ou práticas, baseando-se em observação, registros, comunicação, documentos, filmes, imagens, experiências ou interações (MINAYO, 2017; DENZIN; LINCOLN, 2005).

A estratégia adotada para a pesquisa será o estudo de caso afim de organizar dados sociais a fim de investigar um fenômeno contemporâneo dentro de um contexto, utilizando várias fontes de evidência (YIN, 1989). O estudo de caso pode ser único ou múltiplo, sendo aplicado por quatro diferentes métodos: (i) explicar ligações causais que se tornam complexas para serem analisadas pelo método *survey* ou experimental; (ii) descrever o contexto em que o evento aconteceu; (iii) descrever a intervenção realizada, seja em forma de entrevista ou observação; e (iv) explorar questões que não possuem resultados claros (YIN, 1989).

O projeto de pesquisa adotado para o estudo é de casos múltiplos holísticos, considerado mais robusto, permitindo a comparação entre os diferentes casos e conclusões generalizadas, através de evidências nas unidades de análise (YIN, 2013).

Minayo (2017) salienta que é necessário, no entanto, estar atento a alguns limites e riscos dessa abordagem, tais como o excesso de confiança do pesquisador no seu roteiro de pesquisa, o controle da influência do pesquisador sobre o objeto de estudo, a sensação de domínio de seu objeto de estudo e a falta de detalhes sobre os processos estudados.

A pesquisa de levantamento qualitativo caracteriza-se pela interrogação direta das pessoas cujo comportamento se deseja conhecer. Basicamente, procede-se à solicitação de informações a um grupo significativo de pessoas acerca do problema estudado para, em seguida, mediante análise de conteúdo, obterem-se as conclusões correspondentes aos dados coletados. Na maioria dos levantamentos, não são pesquisados todos os integrantes da população estudada. Antes seleciona-se uma amostra significativa de todo o universo, que é tomada como objeto de investigação. As conclusões obtidas com base nessa amostra são projetadas para a totalidade do universo (GIL, 2002).

O número de selecionados para um estudo de casos múltiplos não segue uma lógica de amostragem, mas deve considerar o número de replicações do caso, tanto literais quanto teóricas, que sejam necessárias ou que o pesquisador queira ter em sua investigação (CHAIS, 2019). O método não probabilístico com amostragem intencional foi utilizado para a seleção dos sujeitos da pesquisa e determinação do número de casos a serem estudados. Este método é usado visto que a generalização, no sentido estatístico, não é o objetivo da pesquisa qualitativa (MERRIAM, 1998). As fases 1 e 2 da macroetapa exploratória e descritiva deste estudo permitiram o levantamento das incubadoras brasileiras e internacionais potenciais de serem estudadas. A partir desta relação de empresas, algumas incubadoras foram convidadas a participar, sem a lógica de amostragem. Mediante a aceitação, as unidades de análise para este estudo foram a Incubadora de Empresas da Universidade de Passo Fundo (UPF), a Tecnopuc Startups, a Universidade de Aveiro Incubator e o Gründungservice HAW Hamburg.

A **Incubadora de Empresas da UPF** foi fundada em 2015, após a inauguração do Parque Científico e Tecnológico da universidade na cidade de Passo Fundo, Rio Grande do Sul, Brasil, tendo como objetivo de estimular o empreendedorismo inovador e de base tecnológica na região. Este ambiente de inovação mantido pela Fundação Universidade de Passo Fundo, disponibiliza aos empreendedores espaço físico para a instalação das empresas e um conjunto de assessorias para fortalecer e consolidar os negócios nascentes ou jovens. Além disso, são desenvolvidas ações como eventos, oficinas, workshops, desafios tecnológicos, entre outros, visando sensibilizar potenciais empreendedores para a criação de startups.

A metodologia de incubação desta incubadora prevê o foco no desenvolvimento dos empreendimentos sob cinco aspectos: empreendedor, mercado, tecnologia, capital e gestão. Essa metodologia está alinhada com as melhores práticas de incubação do país – Modelo Cerne.

O processo de incubação contempla a fase de pré-incubação destinada a pessoas físicas que têm um projeto ou uma ideia de empreender e precisam de assessoria e mentoria que os capacite à tomada de decisão para iniciar o negócio e a fase de incubação, a qual pode ser interna ou externa, destinada a empreendimentos nascentes ou jovens, inovadores e de base tecnológica, que desenvolverão seus

negócios com o apoio de uma equipe multidisciplinar, com vistas à consolidação e autonomia dos negócios. Cada fase do processo de incubação apresenta valores distintos de adesão, que incluem acesso aos diversos serviços ofertados pela instituição.

A **Tecnopuc Startups** é uma configuração atualizada da Incubadora Multissetorial de Base Tecnológica e Inovação da PUCRS – Raiar, a qual iniciou suas atividades junto com o Parque Científico e Tecnológico da PUCRS (Pontifícia Universidade Católica do Rio Grande do Sul) em 2003 na cidade de Porto Alegre, Rio Grande do Sul, Brasil. A Raiar Incubadora de Negócios consolidou-se como um dos principais ambientes de inovação do país, estimulador da comunidade acadêmica a uma postura empreendedora e inovadora, gerando novas empresas, emprego e renda. Em 2019, embasados em novas configurações propostas pela literatura sobre o tema universidade empreendedora, em benchmarking em ecossistemas de inovação américas, bem como na expertise do corpo docente da própria universidade mantenedora, a Raiar Incubadora de Negócios passou por um processo de transição de modelo, a fim de torná-lo escalável. Desta transição surge a Tecnopuc Startups, um ambiente de desenvolvimento, não apenas de uma ou outra startup, mas de um ecossistema de inovação como um todo, onde a startup assume um protagonismo no seu próprio desenvolvimento.

O objetivo da Tecnopuc Startups é estimular e operacionalizar a visão empreendedora na Universidade, através da geração de negócios de base tecnológica e que gerem algum impacto na sociedade (impacto econômico, social ou ambiental). Por meio de diferentes mecanismos, o este ambiente de inovação apoia projetos de negócio, dando suporte em assessorias e infraestrutura, transformando-os em empreendimentos competitivos e prontos para atuarem no mercado.

Os programas da Tecnopuc Startups apoiam negócios em diferentes estágios, desde a ideação, passando pela validação e tração, até a escala. Os custos de incubação pagos pelo empreendedor ou startup variam conforme o programa aderido. O programa Tecnopuc Membership oferece a oportunidade de startups em fase operacional de qualquer lugar do mundo fazerem parte do ecossistema do Tecnopuc, através do acesso a serviços como vitrine de startups; divulgação nos

canais Tecnopuc; conexão com a comunidade; autodiagnóstico; apoio na participação de editais; workshops e eventos; acesso aos benefícios Amazon Web Services; networking e conexões com outros empreendedores.

O Startup Garage é um programa com duração de até 3 meses que desenvolve uma ideia de negócio, através da formulação da proposta de valor e da modelagem do negócio. O Startup Road tem duração de até 12 meses para transformação de um projeto com modelo de negócio e proposta de valor definidos em negócio a partir da construção de um MVP funcional, validação de hipóteses e formalização da empresa. O Startup Orbit é um programa de até 30 meses para negócios com modelos validados e MVP funcional da solução com objetivo de preparar para escala, a partir da ampliação de mercados e aproximação com investidores.

A **Universidade de Aveiro Incubator** foi criada em 1996 com o objetivo de atender demandas da região de Aveiro, Portugal, a qual é vocacionada para indústrias de alto potencial. Este ambiente de inovação tem por objetivo constituir um espaço de acolhimento, dinamização e apoio à incubação de ideias e startups inovadoras, maioritariamente de índole tecnológica e de elevado potencial de crescimento.

Desde 2017, a incubadora está instalada no PCI.Creative Science Park Aveiro Region, que conta com laboratórios de uso comum para instalação de projetos de I&DT do sistema científico e das empresas, bem como a Design Factory Aveiro que é um espaço de colaboração para o desenvolvimento e materialização de produtos e serviços inovadores, através do desenvolvimento de projetos colaborativos interdisciplinares.

A Universidade de Aveiro Incubator integra a rede nacional de incubadoras associada ao programa de incubação da Agência Espacial Europeia (ESA) — a ESA Business Incubation Center Portugal (ESA BIC Portugal). Esta rede apoia projetos e startups no desenvolvimento de novos produtos e serviços a partir de dados e tecnologia espacial.

Com estreita colaboração com a Universidade de Aveiro, a incubadora desenvolve atividades em rede para toda a comunidade da região que permitem a conversão do conhecimento em valor econômico, disponibilizando um programa de incubação de empresas cujos resultados têm sido reconhecidos a nível nacional e

internacional. O programa de incubação UA Incubator Start é constituído por uma oferta integrada de espaços individuais e de coworking, laboratórios, oficinas e áreas comuns, complementados com equipamentos, serviços e eventos de apoio à criação e desenvolvimento de empresas.

O programa de incubação da UA Incubator, com duração total de 3 anos, associam diversos estágios de desenvolvimento de um projeto. A primeira fase chamada de Start busca a aquisição de competências e recursos para prototipar, testar e lançar o projeto desenvolvido no mercado. A fase denominada Start Up visa a obtenção de rendimentos pela comercialização do produto/serviço, crescer a rede de clientes e melhorar a proposta de valor. Por sua vez, a última fase denominada Start Go visa ganhar escalabilidade, expandindo-se para novos mercados (internacionalização), criando um novo produto/serviço ou conquistando novos segmentos no mercado atual. O custo do programa inclui os espaços, equipamentos, serviços e eventos associados a cada uma das fases do programa, variando anualmente em função dos espaços/equipamentos, independentemente da fase de incubação (Start, Start Up, Start Go) em que se encontra.

A UN Incubator foi o berço de um importante case de sucesso, a Sword Health, startup na área da saúde criada em 2015, que em apenas seis anos tornou-se o mais rápido unicórnio entre as startups de origem portuguesa. Este termo popular no mundo de investimentos em inovação foi utilizado pela primeira em 2013 pelo investidor Aileen Lee, descrevendo uma startup com valor acima de 1 bilhão de dólares, o que conota e destaca uma raridade estatística para este tipo de negócio.

O **Gründungservice HAW Hamburg**, localizado na cidade de Hamburg, Alemanha, foi criado em 2007 como uma atividade da Faculdade de Engenharia e Ciência da Computação, estando desde 2011 associada ao Centro de Planejamento de Carreira da Universidade de Ciências Aplicadas de Hamburg (HAW Hamburg). O Gründungservice Incubator HAW Hamburg tem por objetivo apoiar ideias inovadoras até o estabelecimento de uma empresa, através de consultoria e mentoria individuais e trocas em grupos para iniciar novos negócios (pré-fundação, fundação e pós-fundação de startups). Os serviços ofertados pela incubadora são espaço de coworking, apoio a startups e conexão a oportunidades de financiamento. Os requisitos para acessar os serviços ofertados pelo Gründungservice Incubator

HAW Hamburg são estar matriculado na HAW Hamburg, ter um professor ou funcionário da instituição como mentor, não ser uma empresa constituída. Não há custos de acesso aos serviços para o empreendedor.

Além dos ativos ofertados por este ambiente de inovação, o Gründungservice Incubator HAW Hamburg faz parte do projeto "beyourpilot", no qual as maiores universidades de Hamburg uniram forças com o centro de pesquisa DESY para promover e apoiar mais efetivamente os acadêmicos e cientistas que estejam criando startups, expandindo o portfólio de serviços voltados às startups. De acordo com o princípio desta rede, todos os parceiros do projeto disponibilizam seus próprios serviços a todos os membros e ex-membros das organizações acadêmicas afiliadas. Isso significa que vários especialistas, recursos e eventos de toda a cidade de Hamburg estão disponíveis através da rede e de sua plataforma online. Dentre os serviço ofertados estão: aconselhamento pessoal através de mentoria no desenvolvimento de uma ideia de negócio em um modelo de negócio, assessoria na busca de desenvolvimento, assistência na busca de membros adicionais da equipe, portadores de conhecimento, clientes-piloto e parceiros de desenvolvimento de projetos-piloto; assistência para busca e comparação de diversas formas de financiamentos; consultoria regional com especialistas (professores, mentores ou propostas comerciais); recursos físicos como escritórios, laboratórios, máquinas e equipamentos.

Chais (2019) salienta que um fator importante para manter uma condução clara e confiável à compreensão da lógica de coleta e análise dos dados dos estudos de casos múltiplos é o planejamento de cada atividade e a condução de cada caso de forma única. Os estudos de casos são estratégias de pesquisa qualitativa muito populares e amplamente utilizadas, contudo para sua validação e conferência de segurança, cientificidade e confidencialidade dos dados levantados e da própria pesquisa realizada, é necessária, além do planejamento para execução de todas as etapas, a utilização da técnica de triangulação (YIN, 2013), a qual será realizada através das seguintes técnicas utilizadas para coleta de dados: entrevista semiestruturada, observação não participante e fontes documentais. Sendo assim a Figura 35 demonstra o fluxo das fases de planejamento para a etapa qualitativa do estudo.

Figura 35 - Processo metodológico da pesquisa qualitativa.

Fonte: Elaborado pela autora.

O instrumento utilizado como roteiro da entrevista foi desenvolvido a partir das questões levantadas no levantamento bibliográfico, bem como as questões abordadas em Chais (2019). Este roteiro foi elaborado em português e inglês e foi composto por três grupos de questões, os quais podem ser encontrados nos Apêndices C e D. O primeiro grupo intitulado "Informações gerais" abordou seis questões, o grupo "Processos de incubação e avaliação" foi composto por duas questões e o terceiro grupo chamado de "Incubadoras e o desenvolvimento sustentável" abarcava nove questões. Ao final, os respondentes eram convidados a

realizar comentários ou compartilhar documentos que julgavam interessantes à pesquisa. Este instrumento foi validado pelos orientadores do estudo, bem como através de uma mentoria durante o Baltic Univeristy Programme – 7th PhD Students Training com os representes do Centre for Cooperation with Economy, Innovations and Technology Transfer, da Universidade de Lodz, Polônia: Grzegorz Kierner e Julia Skrzypkowska.

Após essa fase de validação, o roteiro foi encaminhado às instituições que participaram do estudo para que pudessem compreender o objetivo da pesquisa e o que nela seria avaliado (CHAIS, 2019). Juntamente com o encaminhamento prévio do roteiro da entrevista validado, foi enviada uma solicitação de autorização de participação ao estudo, sendo que no início de cada entrevista foi realizada a leitura do Termo de Consentimento Livre e Esclarecido, havendo a concordância quanto a participação na pesquisa mediante a assinatura do termo. Após entrevista, cópia digital do termo foi ser encaminhada via *e-mail* para cada um dos participantes, bem como os documentos originais foram arquivados (CHAIS, 2019).

Os convites foram realizados via e-mail e as entrevistas foram previamente agendadas com os entrevistados indicados pela instituição, baseando-se no *expertise* e envolvimento com a temática. As entrevistas foram realizadas entre março de 2020 a agosto de 2020. Considerando fatores pandêmicos da COVID-19 não foi possível realizar as entrevistas de forma presencial e *in loco*, tampouco foram possíveis visitas técnicas guiadas às instalações das incubadoras e às empresas incubadas. Desta forma, as entrevistas ocorreram de forma remota, através de videoconferência com os participantes em horário pré-definido, gravadas em áudio para a transcrição, codificação e análise, conforme indicado por Bardin (2011) e realizado por Chais (2019). As plataformas utilizadas para as videoconferências foram Skype e Google Meet, considerando as preferências dos entrevistados. As reuniões tinham previsão de 60 minutos e foram gravadas utilizando o software QuickTime Player em formato M4A. As transcrições das entrevistas em português foram realizadas manualmente em diferentes arquivos nomeados com cada uma das instituições dos casos analisados. Por sua vez, a transcrição da entrevista realizada em inglês foi realizada utilizando o website Descript.com, o qual permitiu uma transcrição geral, sendo revisada a posteriori.

Os Quadros 6 e 7 demonstram as informações das entrevistas com cada um dos casos estudados, bem como dos entrevistados, respectivamente.

Quadro 6 - Informações das entrevistas com cada um dos objetos de estudo.

Informação	**Incubadora de Empresas da UPF**	**Tecnopuc Startups**	**UA Incubator**	**Gründungservice Incubator**
Data	27 de março de 2020	28 de março de 2020	16 de março de 2020	14 de Agosto de 2020
Duração	1h5min	59min	40min	55min
Idioma	Português	Português	Português	Inglês
Plataforma online	Skype	Skype	Skype	Google Meet

Fonte: Elaborado pela autora.

Quadro 7 - Informações dos entrevistados.

Informação	**Incubadora de Empresas da UPF**	**Tecnopuc Startups**	**UA Incubator**	**Gründungservice Incubator**
Gênero	Masculino	Masculino	Feminino	Feminino
Cargo	Executivo	Analista de projetos	Gerente de serviços de incursão e Gerente de projetos	Diretor
Tempo de atuação	Desde 2009	Desde 2018	Desde 2018	Desde 2018
Formação	Administração e mestrado em Administração	Administração e mestrado em Administração, Inovação e Empreendedorismo	Economista e mestrado em Economia e Gestão da Inovação	Ecotrofologista

Fonte: Elaborado pela autora.

Durante as entrevistas, a técnica de observação não participante foi adotada, a qual possui papel fundamental em pesquisas de abordagem qualitativa, sem a interferência nas ações que está observando nem na coleta de dados. Conforme orientação de Denzin e Lincoln (2008), um roteiro para apoiar os registros sobre o tema e a rotina pesquisa guiou a técnica adotada. O roteiro utilizado para a realização da observação não participante baseou-se em Chais (2019) e Bencke (2016).

Os documentos, escritos ou não, são importantes fontes de dados quando seu teor e conteúdo servem para identificação, verificação e apreciação de uma análise científica (YIN, 2005). A origem dos documentos coletados pode ser de primeira mão ou fonte primária, quando, de ordem pública ou privada, ainda não recebeu

nenhum tratamento analítico. Incluem-se cartas, escritos ou diários pessoais, documentos oficiais, como memorandos, ofícios, boletins, leis, publicações e textos oficiais, fotografias, gravações, formulários, fichas, atas, entre outros. Desta forma, caracterizam-se como documentos de fonte primária os analisados nesta etapa. Duas incubadoras disponibilizaram documentos oficiais, bem como as demais orientaram a busca por tais documentos e publicações no *website* das mesmas.

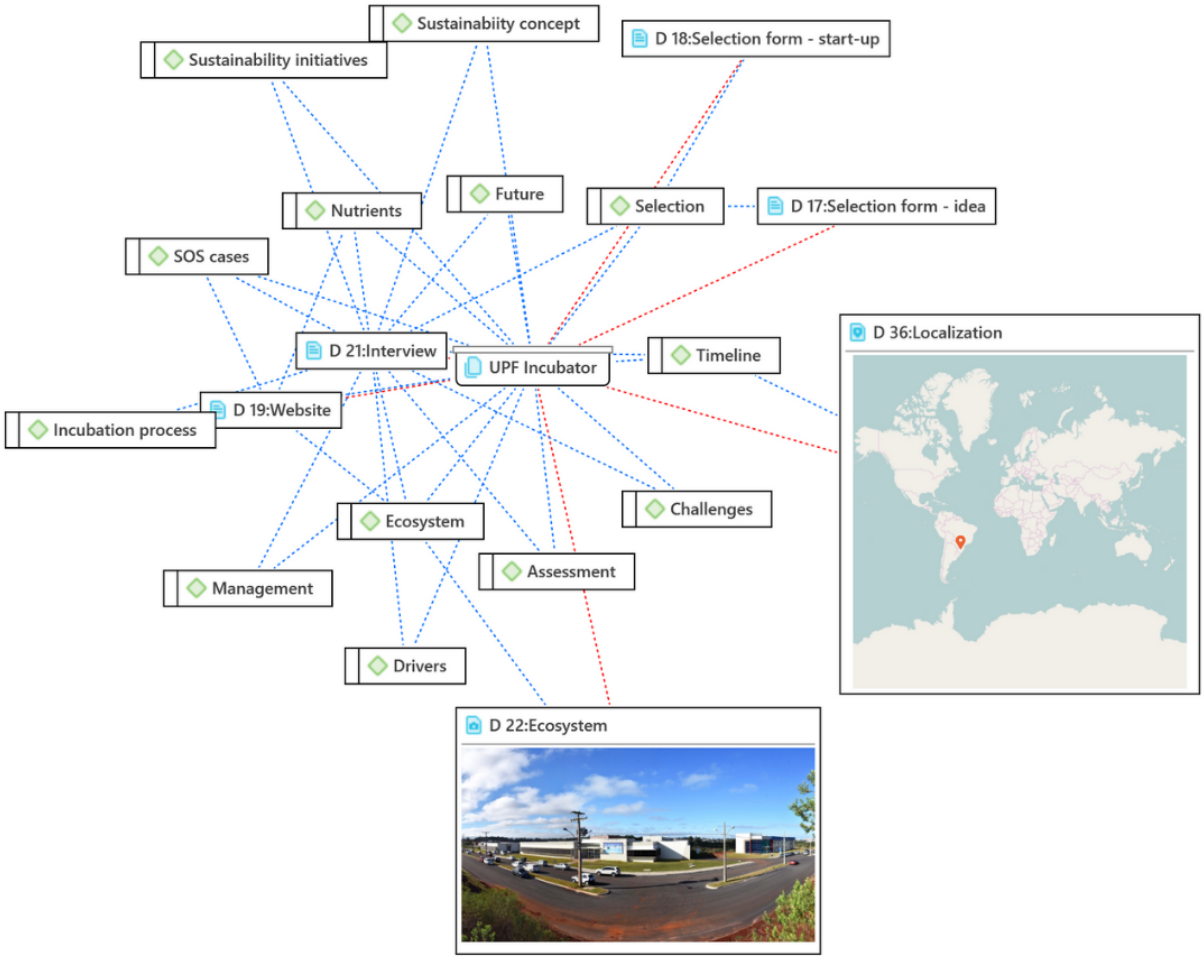
A principal característica da pesquisa qualitativa é a capacidade de lidar com uma variedade de evidências, documentos, artefatos, entrevistas e observações (YIN, 1989). A técnica utilizada para categorização, organização e interpretação dos dados foi a análise documental em fontes documentais relacionadas às incubadoras de empresas entrevistadas. A fim de relatar a frequência de determinado fenômeno, a análise de conteúdo deve seguir rigorosamente e cronologicamente os seguintes passos: pré-análise; exploração do material; e interpretação dos resultados (BARDIN, 2011; MINAYO, 2017).

Inicialmente, os materiais, dados e informações coletados foram organizados e categorizados para o desenvolvimento de um plano de análise, através do *software* ATLAS.ti®. O uso do referido *software* permitiu uma análise ampla e holística das fontes de evidencias qualitativas, tornando os resultados mais visíveis, compreensíveis e acessíveis. A aplicação do *software* ATLAS.ti® tem sido amplamente utilizado em pesquisas de abordagem qualitativa para análises de conteúdo (BRITO et al., 2014; PAULUS; LESTER, 2015; SORATTO et al., 2020), técnica que consiste na categorização, organização e interpretação dos dados, relatando a frequência de determinado fenômeno com base em modelos conceituais já definidos, permitindo uma visão ampla e holística dos dados coletados qualitativamente (MINAYO, 2017; CHAIS, 2019). O *software* possibilita demonstrar os resultados de forma mais compreensível ao pesquisador e acessível aos leitores por meio de *frameworks*, mapas mentais, mapas conceituais, *clusters,* nuvens de palavras e outras figuras (CHAIS, 2019).

Considerando a opção pelo uso de mais de uma técnica de coleta de dados, bem como a intenção de conferir qualidade à pesquisa, fez se uso do método de triangulação, a qual permite a compilação e conflito dos dados levantados sob a ótica de cada abordagem empregada (DENZIN, 2004; CHAIS, 2019). A

triangulação pode ser realizada considerando diversas fontes: dados, investigadores, teorias ou métodos. Neste caso será a triangulação de dados coletados pelas diferentes técnicas – entrevista semiestruturada, observação não participante e consulta a documentos e fontes disponíveis. O *software* ATLAS.ti® foi empregado para a codificação de todo o material coletado acerca das incubadoras objeto de pesquisa. De acordo com Chais (2019), podem ser inseridos os áudios das entrevistas, bem como suas transcrições, fotos de visitas técnicas, diários de observação, documentos de fontes primárias ou secundárias. As Figuras 36, 37, 38 e 39 demonstram e evidenciam o uso de diversas fontes de conteúdo analisadas em cada um dos estudos de caso, proporcionando a triangulação de dados. Nas mesmas figuras é possível observar que todos os 13 códigos estabelecidos foram identificados em pelo menos um dos documentos analisados em cada estudo de caso.

Figura 36 - Rede de fontes de coleta da Incubadora de Empresas da UPF.

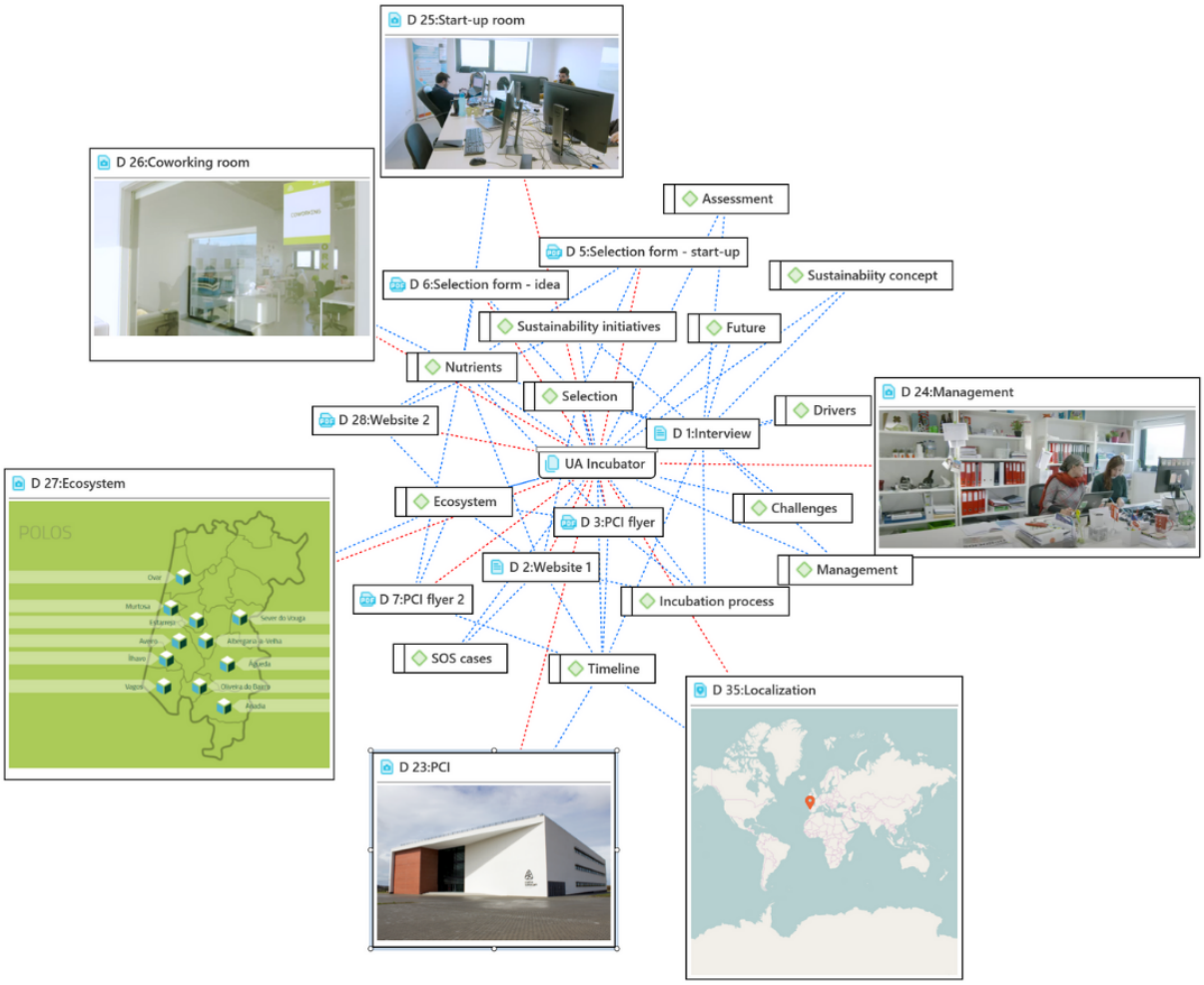


Fonte: Elaborado pela autora.

Figura 37 - Rede de fontes de coleta da Tecnopuc Startups.

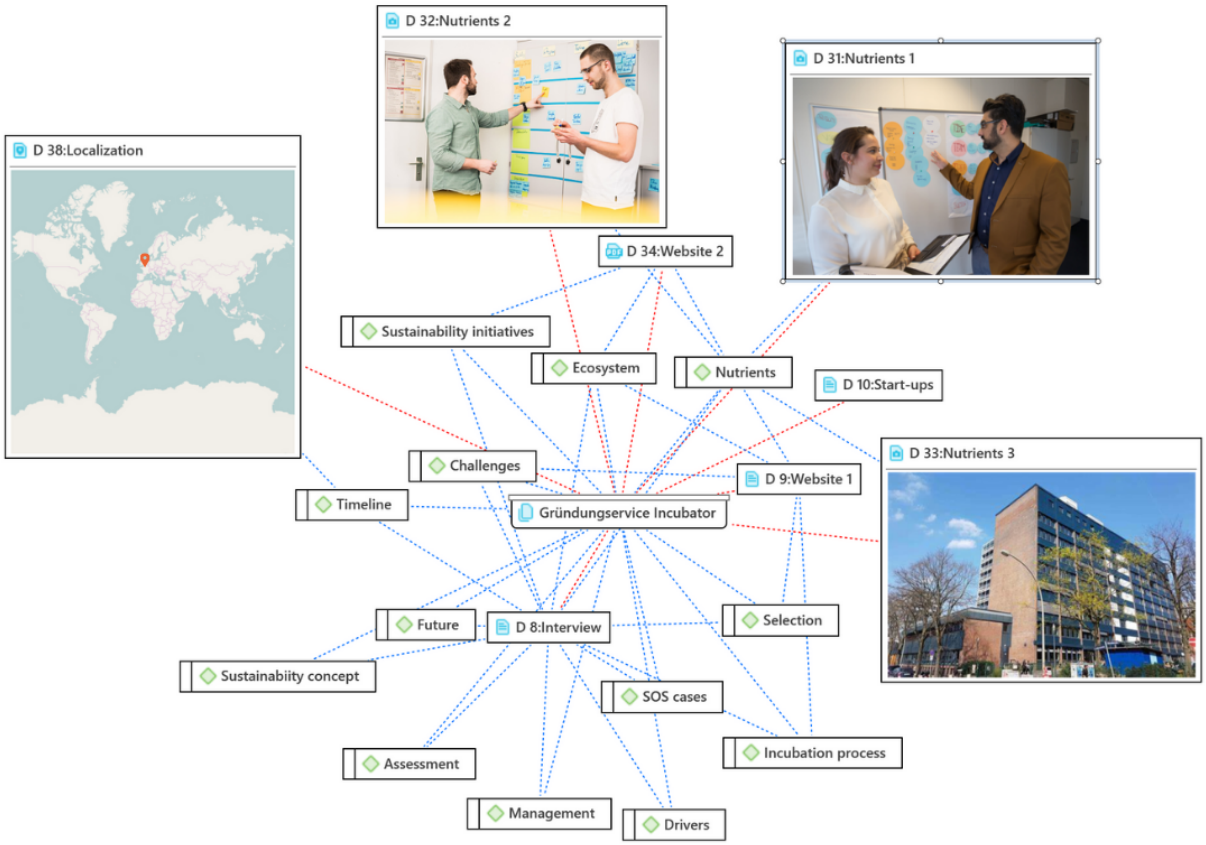
Fonte: Elaborado pela autora.

Figura 38 - Rede de fontes de coleta da UA Incubator.



Fonte: Elaborado pela autora.

Figura 39 - Rede de fontes de coleta da Gründungservice Incubator.



Fonte: Elaborado pela autora.

Com todo o material e dados coletados inseridos no *software*, parte-se para a exploração do material, que consiste em operações de codificação, decomposição ou enumeração dos dados, sendo o material codificado em nós temáticos. Chais (2019) sugere a codificação manual dos nós para pesquisas com abordagem integralmente qualitativa, a fim de conferir mais cuidado e atenção com os dados. Em seguida, pode ser realizada a codificação em nós de relacionamento, criados a partir das relações existentes entre os nós temáticos classificadas em associadas (sem relação, sendo apenas um nó associado a outro), simétricas (quanto um nó possui impacto direto em outro) e unidimensional (quando um nó impacta diretamente outro e é impactado da mesma forma) (CHAIS, 2019). Após análise preliminar das entrevistas, bem como baseado no referencial teórico, foram identificados 13 códigos temáticos unidimensionais: *Assessment* (avaliação); *Challenges* (desafios); *Drivers* (condutores); Ecosystem (ecossistema); *Future* (futuro); *Incubation process* (processo de incubação); *Management* (gestão);

Nutrients (nutrientes); *Selection* (seleção); *SOS cases* (cases de startups orientadas para a sustentabilidade); *Sustainability concept* (conceitos de sustentabilidade); *Sustainaibility initiatives* (iniciativas de sustentabilidade); *Timeline* (linha do tempo). Ao longo das análises a nomenclatura de alguns códigos foi alterada conforme apresentado no Quadro 8.

Quadro 8 - Códigos alterados

Código inicial	**Código adotado**	**Termo em português**	**Justificativa da alteração**
Sustainability initiatives	*Sustainability-oriented initiatives*	Iniciativas orientadas para a sustentabilidade	O termo orientado para a sustentabilidade (*sustainability-oriented*) está sendo foco da tese
Sustainability concept	*SOBI concept*	Conceito de incubadora de empresas orientada para a sustentabilidade	Os conceitos identificados se referiam à sustentabilidade quanto orientação de incubadoras de empresas (SOBI – *Sustainability-oriented business incubator*)
Assessment	*Monitoring and assessment*	Monitoramento e avaliação	Não apenas atividades de avaliação, mas também de monitoramento ao longo do processo de incubação foram identificadas
Future	*Sustainable future*	Futuro sustentável	As perspectivas futuras se referiam a ações voltadas à promoção do desenvolvimento sustentável e alinhamento à sustentabilidade
Management	*Business incubator*	Incubadora de negócios	As citações e conteúdo levantados abordavam não apenas a gestão da incubadora, além disso fatores de equipe de apoio e suporte, consultores, mentores e mantenedora dos ambientes de inovação, bem como aspectos gerais das incubadoras de negócios como um todo

Fonte: Elaborado pela autora.

Outra codificação possível codificação é em casos, criados para cada um dos objetos estudados. Ainda contemplando a segunda fase, além dos códigos temáticos, os materiais foram codificados em casos, agrupando os documentos, transcrições, imagens e demais materiais por objeto de estudo (incubadora de empresas). Essa codificação foi feita manualmente. Este agrupamento pode ser observado nas figuras de evidenciação da triangulação em cada caso (Figuras 36, 37, 39 e 39).

Após a exploração do material, ocorre a terceira fase da técnica de análise de conteúdo, ou seja, o tratamento e a interpretação dos resultados através de quadros de desfechos, diagramas, figuras e modelos representativos a fim de demonstrar as conclusões da análise (BARDIN, 2011).

Com o objetivo de cruzar e comparar visualmente os casos pesquisados nessa fase,

foram elaboradas nuvens de palavras considerando a frequência de palavras em cada caso estudado, podendo identificar semelhanças e diferenças entre eles, bem com nuvens de palavras para cada um dos códigos estabelecidos. Redes de conteúdo foram criadas a fim de evidenciar conexões entres os códigos e nós, bem como em cada um dos casos.

A seção de métodos do artigo 04 da tese – denominado "*How university-led incubators perceive sustainability as an orientation? Fish to fry or a white elephant?*" apresenta detalhes complementares sobre a metodologia adotada.

3.3.2 Etapa de desenvolvimento

Nesta etapa, foram desenvolvidos um modelo teórico e diretrizes para que incubadoras de empresas vinculadas a universidades a se orientarem para a sustentabilidade.

3.3.2.1 Modelo teórico

O modelo teórico é um sistema hipotético-dedutivo que tem por objetivo demonstrar uma realidade através de um conjunto de conceitos, definições e proposições inter-relacionadas que apresentam uma visão holística e sistemática de um fenômeno (VAN RYN; HEANEY, 1992). Para o desenvolvimento do modelo proposto pela tese, observou-se três condições enfatizadas por Gouveia Júnior (1999): valor de uso (reprodutibilidade), valor preditivo (previsão) e valor de face (representatividade).

A elaboração significativa de um modelo teórico, proposta por Souza Filho e Struchiner (2021) prevê o desenvolvimento ou adaptação de um modelo preexistente, através de reflexões sobre sua estrutura e formas conceituais. Este método de desenvolvimento de modelos está pautado em sete macroetapas: delimitação do objeto de estudo; resgate cognitivo; representação do modelo; revisão da literatura; estruturação do modelo; validação do modelo; restruturação e finalização.

A delimitação do objeto de estudo foi identificada junto ao problema de pesquisa proposto pela tese. Após a elaboração da pergunta de pesquisa, inicia-se uma construção e um resgate cognitivo, através do conhecimento prévio e de um embasamento teórico e prático. Esta etapa do desenvolvimento ocorreu através da construção do referencial teórico da tese, bem como da busca de informação de dados e informações através das etapas de aprofundamento teórico e prático na fase exploratória e descritiva do estudo.

A partir da expertise construída através do benchmarking de cooperação, bem como das análises de conteúdo da pesquisa qualitativa por meio da triangulação de dados e dos resultados obtidos na etapa de pesquisa quantitativa, o modelo foi esboçado de forma gráfica, mais palatável cognitivamente, através de um mapa conceitual desenvolvido no software Atlas.ti (SOUZA FILHO; STRUCHINER, 2021). Este tipo de estrutura esquemática tem potencial de representar a visão idiossincrática da equipe de pesquisa, através de uma rede de proposições (SOUZA FILHO; STRUCHINER, 2021).

Com o objetivo de ajustar e acrescentar variáveis, conceitos, dimensões e/ou constructos do modelo teórico, realiza-se uma revisão da literatura baseada nos aspectos chave do modelo representado. Esta interação cognitiva permite a elaboração estrutural do modelo. A estruturação do modelo teórico pode abordar os sistemas cognitivos imagético e verbal de maneira inter-relacionada, facilitando a compreensão das relações e conexões (SOUZA FILHO; STRUCHINER, 2021).

3.3.2.2 Diretrizes

Internacionalmente, guias práticos e diretrizes são referenciados como "*guidelines*". O estudo de Field e Lohr (1990) foi o primeiro a descrever "*guidelines*" como indicações desenvolvidas sistematicamente para orientar determinada atividade em uma determinada circunstância.

De acordo com o dicionário Oxford (2022), este é um conjunto de instruções que orienta a execução de algo, determinando o curso de uma ação, ou até mesmo auxilia em tomadas de decisão ou formação de opinião. O dicionário Cambridge (2022) determina que o termo "*guidelines*" objetiva agilizar processos específicos de acordo com uma rotina definida ou prática.

A partir do embasamento teórico e prático adquirido com as etapas metodológicas precedentes, especialmente do constructo do modelo teórico validado, sistematizou-se pontos relevantes para a reorientação das incubadoras universitárias à sustentabilidade em um guia prático (*playbook*) escrito em inglês, a fim de buscar a universalização do mesmo.

De acordo com o dicionário Cambridge (2023), o termo "*playbook*" é a descrição de um conjunto de sugestões, tarefas, métodos e estratégias que são consideradas adequadas para atingir um determinado objetivo. O *playbook* apresenta previsibilidade e repetitividade para que uma atividade particular possa ser escalável.

3.3.3 Etapa de validação

A fim de validar modelo desenvolvido e as diretrizes propostas, esta macroetapa consistiu na avaliação destes por parte de *stakeholders* de uma incubadora de empresas vinculada a uma universidade brasileira, atendendo ao último objetivo da tese, ou seja, verificar até que ponto o modelo conceitual e o guia prático poderiam orientar um ambiente de inovação a reposicionar-se para a promoção da sustentabilidade. Abaixo descreve-se a metodologia aplicada para tal fase.

3.3.3.1 Validação do modelo

Na pesquisa qualitativa, a fim de atender o rigor do estudo, há a necessidade de avaliação dos resultados, ou seja, identificar "se os pesquisadores estão vendo o que eles pensam ver" (STRAUSS; CORBIN, 2008). Validar significa verificar a consistência de um modelo, revisar e discutir possíveis alterações para as variáveis, conceitos, dimensões e/ou constructos contidos no modelo teórico desenvolvido pelo pesquisador conexões (SOUZA FILHO; STRUCHINER, 2021). Este é um fator importante na construção teórica, pois carrega diferentes visões sobre possibilidades de modificações, adições, exclusões ou revisões da estrutura proposta (WESTMORELAND et al., 2000).

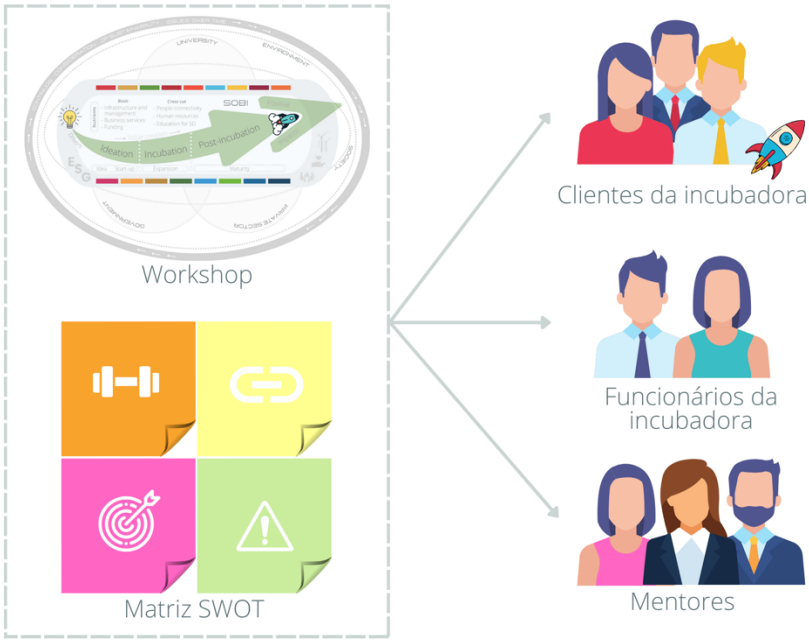
Após seguir a metodologia proposta pela Teoria Fundamentada nos Dados (GLASER; STRAUSS, 1967), a validação do modelo foi realizada por *expertise* na área do estudo, através de pessoas com vivência do fenômeno estudado (STRAUSS; CORBIN, 2008; SOUZA FILHO; STRUCHINER, 2021). Corbin e Strauss (2015) recomenda que aplicabilidade do modelo considere quatro critérios: ajuste, compreensão, generalização e controle. Entretanto, a forma de validação pode ser dinâmica, cabendo ao pesquisador identificar a forma mais adequada e eficiente.

Uma das técnicas utilizadas é a roda de conversa, tendo um caráter dialógico e dinâmico (ADAMY et al., 2018). Esta técnica atende às necessidades do estudo, sendo uma efetiva estratégia que valida os dados e o modelo teórico, proporcionando uma oportunidade de reflexão e consolidação das ideias (ADAMY et al., 2018). Além disso, Adamy et al. (2018) enfatizam que esta é uma oportunidade de troca, compartilhamento e desenvolvimento do conhecimento, representando de fato o fenômeno estudado.

Considerando readequações em seu programa de incubação, bem como em seu reposicionamento após o momento da entrevista, a incubadora de empresas convidada para a

participar da etapa de validação do modelo foi a Incubadora UPF. Os representantes foram convidados via e-mail, realizando-se um agendamento prévio para a realização de um workshop com duração de aproximadamente uma hora no dia 05 de novembro de 2022 na Arena UPF. Para este workshop foram convidados clientes (pré-incubados, incubados e graduados), mentores e funcionários da incubadora. A Figura 40 demonstra um esquema da proposta de validação do modelo.

Figura 40 - Esquema de validação do modelo teórico.



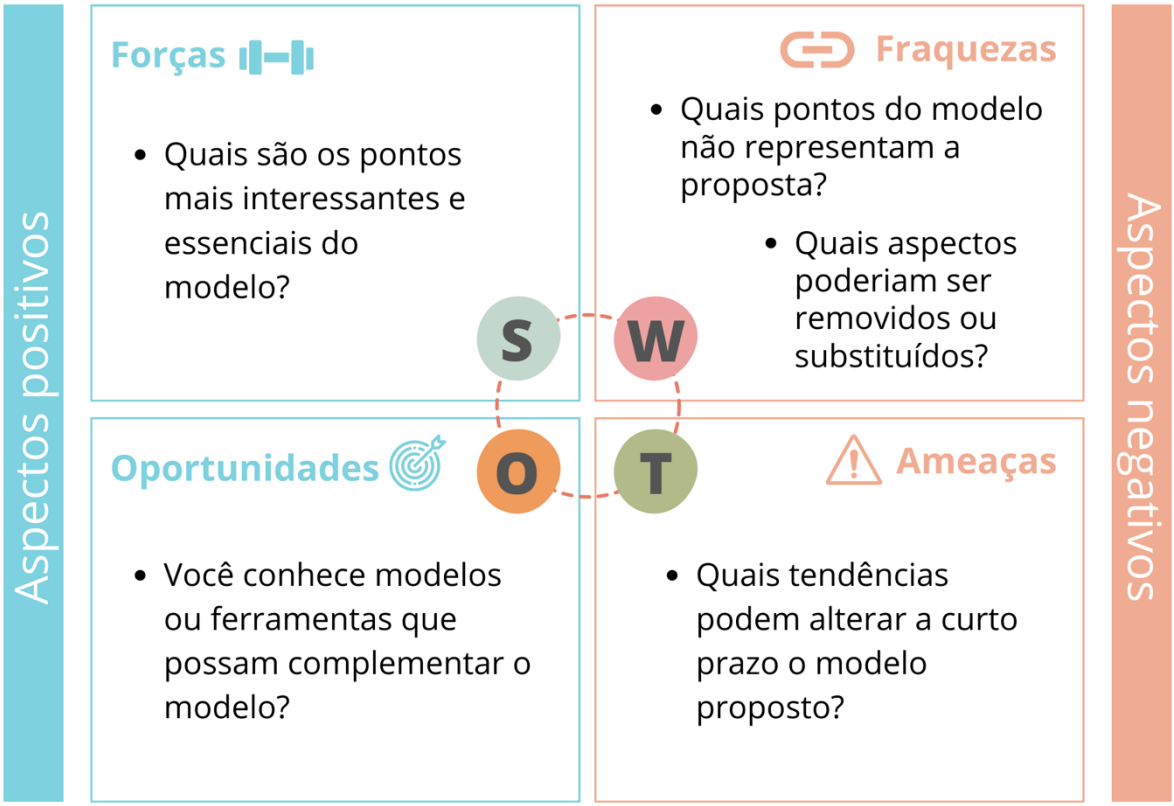
Fonte: Elaborado pela autora.

Após a leitura do Termo de Consentimento Livre e Esclarecido e a concordância quanto a participação na pesquisa mediante a assinatura do termo, o modelo proposto foram apresentados pela pesquisadora aos participantes através de um material visual (Apêndice E), demonstrando cada componente integrante do modelo teórico conceitual que servem de embasamento às diretrizes práticas. A pesquisadora instigou discussões, retomando pontos, esclarecendo ideias, explicando questões que pudessem ser ambíguas, e permeando o diálogo. As intervenções foram livres, não havendo rigidez quanto ao rumo da conversa.

Ao final do processo, os participantes foram convidados a expressar suas ideias e sentimentos sobre o modelo de forma anônima, verificando a relevância das informações levantadas, bem como identificando os pontos fracos e fortes e oportunidades de melhoria para o modelo proposto através de um formulário *online* disponibilizado pela plataforma *Google*

Forms. Para tanto, foi utilizada uma matriz SWOT (Strengths, Weaknesses, Oportunities e Threats) como ferramenta de coleta e sistematização de dados (FUERTES et al., 2020). Esta matriz permitiu a avaliação qualitativa de forças, fraquezas, oportunidade e ameaças do modelo proposto. O modelo adaptado e adotado para o processo de avaliação está demonstrado na Figura 41.

Figura 41- Modelo de matriz SWOT utilizado.



Fonte: Elaborado pela autora.

3.3.3.2 Refinamento do modelo

Souza Filho e Struchiner (2021) recomendam, a partir da avaliação dos especialistas, uma análise qualitativa referente às contribuições e reflexões consensuais obtidas através das ferramentas de diagnóstico da validação do modelo desenvolvido (workshop e matriz SWOT), a construção de uma visão holística e geral das necessidades de refinamento do modelo apontadas pelos participantes e observadas pelo pesquisador. Sendo assim, o pesquisador finalizou o processo metodológico realizando as revisões e ajustes necessários para a entrega de um modelo validado. O modelo validado permitiu a elaboração de uma cartilha com

diretrizes práticas, passível de aplicabilidade em incubadoras de empresas que busquem engajamento no contexto do desenvolvimento sustentável.

O *playbook* está apresentado no Apêndice G e o modelo no artigo 05 da tese, denominado "*Reshaping BIs in universities: looking for a theoretical framework and guidelines for sustainability-oriented business incubators*".

3.4. QUALIDADE DA PESQUISA

A qualidade da pesquisa está relacionada à rigorosidade de aplicação metodológica, bem como à transparência no tratamento dos dados. O rigor, em termos qualitativos, é uma forma de estabelecer confiança nos resultados de um estudo de pesquisa (THOMAS; MAGILVY, 2011). A fim de assegurar a robustez do estudo, Guba e Lincoln (1989), recomendam o atendimento a quatro critérios: credibilidade, transferibilidade, confiabilidade e confirmabilidade. Considerando o atendimento aos referidos critérios, esta pesquisa realizou as seguintes ações descritas no Quadro 9.

Quadro 9 - Informações dos entrevistados.

Critério de qualidade	**Descrição do critério**	**Ações consideradas no estudo**
Credibilidade	Grau em que a descrição representa, com precisão, o fenômeno social estudado	- Triangulação de dados: entrevista, observação não participante e documentos; - Os dados apresentados estão codificados; - A apresentação dos resultados é sistematizada; - O modelo foi aprovado por uma quinta incubadora, não participante da etapa de coleta de dados, a fim de não tendenciar o processo de validação do modelo.
Transferibilidade	Capacidade de os resultados serem aplicados em outros contextos e configurações	- Os procedimentos metodológicos estão descritos, permitindo a replicabilidade da metodologia adotada; - O método de seleção das incubadoras de empresas participantes foi transparente; - As abordagens teóricas que compõem o estudo estão apresentadas no referencial teórico da tese.
Confiabilidade	Consistência e integridade do estudo	- A elaboração do roteiro de entrevista semiestruturada baseou-se em publicações científicas;

		- A transcrição das entrevistas foi revisada, bem como as codificações propostas; - A metodologia está detalhadamente descrita.
Confirmabilidade	Identificação dos benefícios da pesquisa e de contribuições para o campo de estudo	- Os resultados serão publicizados e publicados academicamente; - As incubadoras participantes receberam uma cópia do modelo validado; - Foram apresentadas as principais contribuições e sugestões de estudos futuros.

Fonte: Elaborado pela autora.

4. ARTIGO 01

Sustainability as orientation in university-linked business incubators: fact or fiction?

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Innovation & Management Review
Status: Desk review

Abstract: Business incubators are innovation environments comprised of elements that support the development of start-ups. Especially the university-linked ones are potential promoters of sustainability by supporting new business models and fostering the development of technologies. The present study was motivated by research gaps concerning university incubators that are focusing on sustainability and promoting it through their strategy and services. In this sense, this study aims to explore to which extent Brazilian and worldwide BIs are sustainability-orientated. Qualitative research was carried out to look over the sustainability orientation of the top university-linked business incubators worldwide and the Brazilian ones which took part in a national training program to prepare innovation agents to develop impact businesses. Through a qualitative document analysis, this study has mapped 140 business incubators in Brazil (n=52) and the international context (n=88), assessing their direction for sustainability and the UN Agenda 2030 and ESG factors. Worldwide, leading business incubators that prioritize sustainability were identified. The study found that Brazilian business incubators are actively pursuing sustainable development, positioning the country as a leader in the global scenario. The paper concludes that training programs focused on this theme are relevant to influence incubators focused on sustainability to become a reality.

Keywords: Incubator. University. SDGs. ESG. Start-ups. Sustainable innovation.

1. Introduction

Notably, the economic system in which the world used to live has produced numerous benefits for humanity. However, negative externalities are increasingly evident, such as inequality of opportunities, social injustice, and environmental degradation (ICE 2019). Maintaining development with a balanced between social, environmental, and economic dimensions without harming current and future generations is one of the most significant challenges the world faces nowadays (Moldavska and Welo 2019).

These concerns are not recent. During the 1970s, approaches and discussions about a systemic and horizontal form of economic development emerged (Barbosa 2008). Since then, several studies on the theme have come up regarding this issue (Paoli and Addeo 2019). In addition, global agreements, events, and conventions have effloresced the sustainability field (Beuron

2016). Since 2016, the United Nations Agenda 2030 has guided nations toward sustainable development (UN 2016). These movements stimulate market opportunities to develop empowered businesses to create value and meet societal demands (Kuckertz et al. 2020). It is noted technological innovations provide knowledge to support the sustainable transformations required for the future of humanity (UN 2016; TU Delft 2018).

University-linked business incubators (BIs) are potential supporters of the development and diffusion of technological innovations, providing opportunities for nascent start-ups to consolidate in commercial markets through their mentorship and support structures (Bizzotto 2003). These innovation environments must establish strategies to stimulate sustainable innovations to promote positive social and environmental impacts. In this sense, incubators oriented towards sustainability are a worldwide trend, and increasingly traditional incubators, and even technological incubators, have been reconstructing their missions, objectives, and positioning (Bank et al. 2017; Kanda and Bank 2015; Fonseca and Jabbour 2012).

Attention to research and practices for incubators to structure themselves and support sustainable development through their start-ups has increased (Bank et al. 2017). However, despite the popularity of incubators in literature and practice, few studies focus on sustainability-oriented incubators (Bank et al. 2017; Fonseca and Jabbour 2012). Concerning sustainability assessments, Cosa (2013) states that most research is limited to financial analysis. Furthermore, knowledge about how incubators are going toward this transition task is minimal (Fonseca and Jabbour 2012). The limited knowledge points to a notable scientific knowledge gap (Bank et al. 2017). However, the interrelationship of these research areas remains nascent, and there is a need to capture and reflect on best practices (Apostolopoulos et al. 2018). This study investigates to which extent Brazilian and worldwide BIs are focused on sustainability orientation.

2. Sustainability orientation

Sustainability requires a systemic response involving transformative changes, notably in knowledge, policy, and institutional systems from all sections of society (Adams 2017). Sustainability goes beyond environmental conservation and it can only be achieved if social, environmental, and economic dimensions evolve harmoniously. Long-term structural changes in the economy and the social system are required, reducing the consumption of natural resources while maintaining economic potential and social cohesion (Sikdar 2004; Kuckertz and Wagner 2010).

In the 80s, the sustainability concept emerged in the scientific field as the synergy of social, environmental, and economic issues (Barbosa 2008; Paoli and Addeo 2019). Since 2015, this term has increasingly received more highlights due to the UN Agenda 2030 and its 17 Sustainable Development Goals (SDGs) (UN 2016). Lately, sustainability has been addressed also in the private sector's business practices (Paoli and Addeo 2019; Claro and Esteves 2021) through metrics (Environment, Social, and Governance – ESG) that engage environmental,

social, and governance issues in making decisions and enterprises' business plans (Friede et al. 2015; Gillan et al. 2021).

Sustainability-oriented businesses, also called impact ones (Bombardi et al. 2018), approach the concern about social responsibility and environmental protection in financially feasible businesses (Kuckertz and Wagner 2010). Sustainability can be brought into the entrepreneurship area through innovation (Carayannis and Campbell 2010). It means sustainability-oriented businesses integrate different impacted or impacting actors in the pursuit of innovations that create new markets, and have socio-environmental responsibility and financial sustainability, simultaneously (Bombardi et al. 2018)

As much as many organizations and innovations have turned to sustainability orientation, the sustainability term presents a very broad spectrum of meaning, often to the point of trivialization. Given the broad range of meanings associated with the term, Ben-Eli (2018) proposed five principles of sustainability, as Table 1 shows.

Table 1 Five principles of sustainability

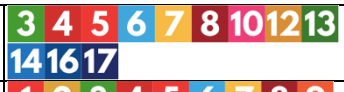
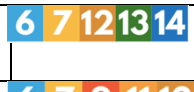
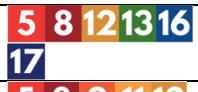
Principle	**Description**
Material Domain	Constitutes the basis for regulating the flow of materials and energy underlying existence.
Economic Domain	Provides a guiding framework for defining, creating, and managing wealth.
Domain of Life	Provides the basis for appropriate behavior in the biosphere concerning other forms of life.
Social Domain	Provides the basis for social interactions.
Spiritual Domain	Identifies the necessary attitudinal orientation and provides the basis for a universal code of ethics.

Source: Ben-Eli (2018)

Adams (2017) and Rajagopalan et al. (2018) propose business approaches should align SDGs and ESG to maximize value creation and enhance knowledge of the impact of business activities on sustainable development. In this regard, organizations can benefit from reducing risk, identifying opportunities, and delivering long-term, innovative solutions, and technologies for addressing sustainable development (Bergman et al. 2020). The sustainability-oriented value creation process addresses capital as financial, manufactured, intellectual, human, social and relationship, and natural (Adams 2017). Table 2 presents the listed capitals, factors of ESG, and their related SDGs.

Table 2 Value creation capitals and SDGs

Capital	**SDGs**	**ESG Factors**		
		Environment	*Social*	*Governance*
Financial	3 4 5 6 7 8 9 10 11 12 13 14 15 17	6 7 9 11 12 13 14 15	3 4 5 6 8 9 10 12	5 8 9 11 12 13 17
Manufactured	2 4 6 7 9 11 13 14 17	6 7 9 11 12 13 14	2 4 6 9 12	9 11 12 13 17
Intellectual	3 6 7 10 12 13 14 16 17	6 7 12 13 14	3 6 10 12 16	12 13 16 17

Human				
Social and relationship				
Natural				

Source: based on Adams (2017) and Rajagopalan et al. (2018)

Brito et al. (2018) proposed that sustainability-oriented businesses and start-ups developed into incubators should incorporate sustainability principles embodied in the dimensions of value, technology, and behaviour. Table 3 presents the dimensions and principles.

Table 3 Principles for business incubators foster sustainability-oriented business

Dimensions	**Principles**
Value	Honesty Social Justice Ethics
Technology	Development of products, services, and sustainable technologies
Behavior	Responsible production Resources optimization Impact concern Employees awareness Population awareness

Source: Brito et al. (2018)

3. University incubator: a driver for sustainable business

Research-based universities have transformed toward an entrepreneurial and knowledge-based innovation system, cardinal features of the fifth-generation university (Etzkowitiz 2003; Carayannis and Campbell 2010). Academia plays an active role in the quintuple helix innovation model as a provider of innovation environments to promote sustainable entrepreneurship. It is supposed to be the provider of innovation environments to promote innovative and sustainable entrepreneurship (Carayannis and Campbell 2010).

Since the 50s, many business incubators (BIs) have been supported by universities that facilitate, connect, and support start-ups to develop new ideas (Hassan 2020; Bombardi et al. 2018). BIs may assist these innovative ideas to turn into successful ventures through their physical facilities and offered services (Azevedo et al. 2016). The educational system creates a favorable environment for university incubators, better than other types of incubators to prepare and support entrepreneurs (Hassan 2020).

Business incubators can play an innovation-driving role in bridging the gap between the academic environment and the private sector. Through this, these innovation environments should be perceived as agents promoting sustainable, inclusive, and impactful start-ups (Skaik 2013; Cardoso et al. 2008; UNDP 2014). In the private sector, technology innovation is a foremost tool and a prerequisite for empowering impact businesses and achieving the 169 ambitious targets that collectively frame the 17 SDGs (ICE 2019; UN 2016).

Market opportunities have emerged from sustainable development movements to empower businesses to create value and meet societal demands (Kuckertz et al. 2020; UN 2016). Technological innovations that provide knowledge to support sustainable transformations are critical for the future of society (TU Delft 2018; UNECE 2021). University-linked business incubators play a role as a connector between research, technology, capital, and knowledge to catalyze the development of new businesses (Scaramuzzi 2002). University-linked incubators are potential supporters of the generation and diffusion of technological innovations, providing opportunities for nascent companies and start-ups to consolidate in commercial markets through their support and mentoring structures (Bizzotto 2003).

University incubators should not overlook these opportunities and need to adapt their structures and services to meet the demands of society. They need to tune their structures and services to the new demands of society, reviewing their focuses, processes, and services in the context of economic, social, and environmental sustainability (Brito et al. 2014; Bombardi et al. 2018). Indeed, incubators oriented towards sustainability are a worldwide trend (Bank et al. 2017), and several business incubators have shown commitment to supporting environmentally-friendly or socially responsible innovations along with their incubated companies (Hernández and Carrà 2016).

4. Methods

This research studied a group of 140 business incubators in Brazil (n=52) and worldwide (n=88), classified according to their associated institution, the focus of activity, and impact orientation. Documental research was conducted using secondary sources such as official website information, official documents, internal reports, application forms, calls for applicants, newsletters, and marketing videos.

4.1 Subject of analysis

University-linked business incubators are the subject of analysis. It means association with, led, managed, supported, or sponsored by one or more universities. Their core is the promotion of technological innovations via knowledge sharing and the interaction between academia and companies (Scaramuzzi 2002). In line with their core, most university-linked are technology-based (Medeiros et al. 1992; Azevedo et al. 2016), and all technological BI are actively involved with at least one university from the local or regional innovation ecosystem (Dornelas 2002).

4.2 Worldwide business incubators mapping

InBIA International Business Innovation Association estimates about 7,000 to 15,000 business incubators worldwide (NIOS 2022). This study carried out mapping research of the preeminent worldwide business incubators from the UBI Global World Rankings of University-linked Business Incubators and Accelerators. It is the most recognized ranking for business incubators, a part of the UBI Global World Benchmark Study, a study that evaluates the performance and best practices of BIs. This benchmark study reveals successful stories to help incubators understand their role in the global innovation ecosystem. Since 2013, more than 700 incubators from over 70 countries in six geographic regions have participated (UBI 2018). The top business incubators were identified and ranked in four editions: Top University Business Incubators Global Benchmark 2013; Global Benchmark 14/15 Report; Global Benchmark 15/16 Report; World Rankings 17/18 Report.

UBI Global ranks university-linked business accelerators and incubators employing different key performance indicators (KPIs). These KPIs form the base of seven subcategory scores into three main categories, such as Value for system (Economy enhancement and Talent retention), Value for client start-ups (Competence development, Access to funds, and Access to network), and Value for incubation program (Program attractiveness and Post-incubation performance). The individual Program Impact and Performance Scores (PIPS) are calculated using the KPIs. The highest-scored programs are recognized as the best BIs in each category. Sustainability orientation is not an assessment dimension for UBI Global ranking.

UBI Global divides the incubators into three categories: managed by, affiliated with, and collaborating with one or more universities. This study considered BIs directly operated by one or more universities (managed ones) and BIs formally affiliated with one or more partner universities based on a contractual agreement. Business incubators that collaborate informally with universities were disregarded. At any moment, the incubators may make informal interactions with universities, and this relationship could not be evidenced (Azevedo et al. 2016). The reports listed eighty-eight business incubators managed by or affiliated with a university.

4.3 Brazilian business incubators mapping

In 2019, the National Association of Entities Promoting Innovative Enterprises (ANPROTEC) mapped 369 business incubators in Brazil (ANPROTEC 2019). Since 2015, this Brazilian association has performed a program to train and prepare business incubators and accelerators to follow the sustainability orientation, promoting and fostering impact business. This program is called Impact Incubation and Acceleration Program. Its main objective is to explore the potential of accelerators and incubators to influence the entrepreneurial agenda in Brazil. It disseminates the concept of sustainable/impact business and strengthens solutions for social and environmental challenges (ICE 2019).

4.4 Content analysis

During May and June 2019, the research gathered information from secondary sources regarding the incubators' activities, aims and vision values, offered services, incubation programs, and cases of incubated or graduated companies. Cardoso et al. (2008) suggest being attentive to biased behavior in the research.

Bardin (2011) states that reading and interpreting the content of any material coming from verbal or non-verbal communication can be used as an analysis technique. The content was analyzed shedding light on initiatives addressing sustainability principles, SDGs targets, and ESG factors (Ben-Eli 2018; Rajagopalan et al. 2018; Brito et al. 2018; Adams 2017). The content analysis had an inductive-constructive approach (Moraes 1999; Locke 2007) by means of systematization through the ATLAS.ti software, following qualitative data analysis' steps proposed by Yin (2003). Following up literature review addressing SOBIs and sustainable entrepreneurship was carried out.

4.5 Classification of BIs

For the classification of the university-linked business incubators, the study adopted the most relevant construct of the sustainability approach (Sikdar 2004), considering dimensions of economic, social, and environmental orientation. Table 4 presents the classification adopted for this study.

Table 4 Business incubator's impact focus

Focus	**Aim**
Environment-oriented	Mitigating environmental impacts by fostering green and clean technologies. It is focused on aspects of the Material Domain and Domain of Life.
Social-oriented	Promoting social and inclusive entrepreneurship and fostering social businesses without the need for financial profits. It is focused on aspects of the Ethics Domain and Social Domain.
Economy-oriented-	Promoting highly scalable and high-tech impact business and technologies and fostering the earliest possible financial return. It is focused on aspects of the Economic Domain.
Sustainability-oriented	Promoting businesses with market potential, financial viability, and potential for economic return, shedding light on environmental and social impacts. It is focused on all domains. Their orientation involves the sustainability axes harmoniously.

Source: Authors based on Kuckertz and Wagner (2010); Claro and Esteves (2021); Sikdar (2004); Ben-Eli (2018)

4.6 Cases from the SOBIs

This study also mapped some cases of start-ups and ventures from sustainability-oriented business incubators. The success cases were linked to Sustainable Development Goals (SDGs), considering their targets.

4.7 Selection process of SOBIs

The selection process is one of the most crucial factors in an incubation program (Bank et al. 2017). An in-depth scanning was carried out using secondary sources addressing tenant selection and recruitment, such as forms, calls, notices, and official documents. This step aimed to identify requirements and criteria used by sustainability-oriented BIs for tenants' recruitment. The mapped requirements were linked to Sustainable Development Goals (SDGs) and ESG factors.

5. Results and discussions

5.1 Worldwide business incubators mapping

Considering the sample of 88 mapped business incubators worldwide, a BI is no longer working, and two official websites were not found. However, only 9% of university-linked business incubators included sustainability aspects in their incubation programs, which contradicts the claims of Hernández and Carrà (2016) that many business incubators worldwide are committed to nurturing sustainability.

The majority (76%) of top worldwide business incubators focus on economic impact and high-tech business development, while 5% focus on social impact businesses and 6% focus on fostering clean and green technologies. According to Skaik (2013), there is a growing trend among incubators to focus on environmentally-oriented businesses. Overall, the data shows that while sustainability-oriented business incubators exist, they are less common than those focused on economic and technological development. Figure 1 shows the percentage regarding the focus of the top-worldwide BIs and the localization of the sustainability-oriented ones by continent.

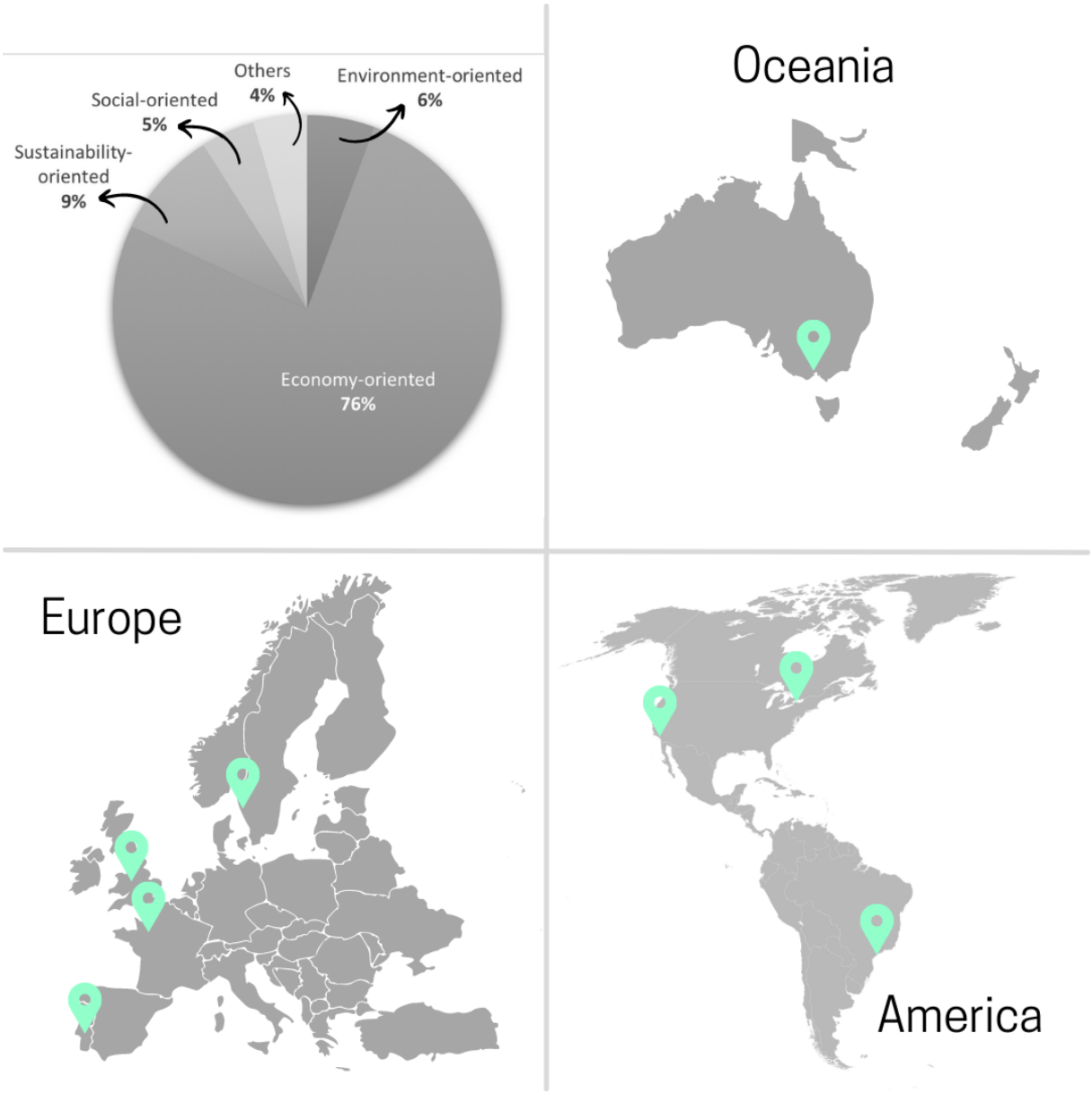


Figure 1 Business incubators' focus (%) and localization of the sustainability-oriented ones.

Source: Authors

Although Europe is the third continent with the highest number of incubators worldwide (NIOS 2022), this study's results point out that Europe concentrates the highest number (n=4) of top-worldwide university-linked business incubators oriented to sustainable development. There is a trend in European sustainability-profiled incubators. Bank and Kanda (2016), Bank et al. (2017), and UNECE (2021) carried out some studies in this sense. North America is the continent with the most business incubators worldwide (NIOS 2022). In this continent, the study found two sustainability-oriented business incubators. One business incubator in South America and one BI in Oceania could be classified as oriented to sustainability.

The top-worldwide sustainability-oriented BIs have supported compelling cases of start-ups. Table 5 shows some of these success cases and the SDGs they are addressing.

Table 5 International start-ups' cases from sustainability-oriented BIs.

Start-up	Continent	Description of the services and products	Related SDGs
A	Europe	It is a developer of crop analysis tools to increase efficiency in the agri-food industry. Sprayers or harvesters provide the next step of data-driven farming to producers. The cloud platform ensures agronomic insights that compound with each use. This technology can mitigate the use of large amounts of chemicals.	
B		It is an AgBiotech developing next-generation plant breeding technologies to create future plants ten times faster.	
C		This business is based on research and development of bioclimatic architecture and sustainable urban regeneration, supervision, consulting, study, evaluation, expertise, project design and characterization of artistic, architectural, urban, and archaeological heritage, planning, and metalworking. On the other hand, to develop animation activities, investing in new business models associated with tourism.	
D		This business enables more efficient and innovative research and development practices of battery development by providing groundbreaking analysis software. It leads to more effective processes, shortened development cycles, and the creation of higher-performing and more sustainable batteries. New battery technology plays a crucial role in more sustainable societies.	
E	North America	This start-up established the first line of compostable, plant-based tableware such as hot and cold cups, plates and bowls, and utensils. Nowadays, this is the number one supplier in this vertical.	
F		This dynamic and innovative tech company is dedicated to promoting health, comfort, and sustainability. It integrates hardware and software to address public health key concerns and technological solutions to enhance comfort and sustainability.	
G	South America	This spin-off promotes and facilitates innovation in the energy sector through specialized matchmaking and management of innovative projects. It uses open innovation to connect companies, industry challenges, and problems with a network of carefully selected researchers, technology centers, universities, and start-ups. They build partnerships through collaborative work and propose innovative solutions, assisting in new technology development for the market.	
H	Oceania	Start-up focused on developing a physical infrastructure product to make poultry farming more productive and ethical.	

These cases provide evidence and reiterate that university-linked incubators are effective supporters of the development of sustainability-oriented technological innovations (Bizzotto 2003; TU Delft 2018).

5.2 Brazilian business incubators mapping

This study points out twenty-one Brazilian university-linked business incubators focused on socio-environmental impact and financial viability. It means 42% of the graduated BIs from the Impact Incubation and Acceleration Program. Figure 2 reveals the percentage of each BIs' orientation and indicates the location of each Brazilian business incubator.

Figure 2 Brazilian business incubators' focus (%) and localization of the sustainability-oriented ones.

Source: authors

The Brazilian Southern region has the highest concentration of sustainability-focused incubators (n=8), followed by the Southeast region with seven incubators. These regions are known as innovation ecosystems in Brazil, and this study's findings support the increasing trend towards sustainability orientation in the Brazilian scenario, as reported by Cardoso et al. (2008), Dalmoro (2009), and Brito et al. (2014). The sustainability-oriented incubators in Brazil have supported startups that offer products or services with socio-environmental impact. Table 6 presents some of the case studies of these startups and the SDGs they address through their outcomes.

Table 6 Brazilian start-ups' cases from sustainability-oriented BIs.

Star-up	Brazilian region	Description of the services and products	Related SDGs
A	South	It develops technological and green building solutions, drastically reducing the high-energy costs of civil construction. It also reduces the amount of water and the waste of materials in its projects. To do this, they use wooden structural panels with the application of the most up-to-date solutions and techniques for prefabricated construction, making the work faster and more efficient.	
B		The service is a food voucher app and a payment method for a sustainable food network composed of agroecological fairs, organic delivery baskets, and other local enterprises. It encourages the health of people, the environment, and the local economy.	
C		The main focus of this start-up is technological and scientific development aimed at solving environmental problems, such as the conservation of biodiversity, monitoring fauna, and flora, combat of exotic organisms hacking, and air quality and water monitoring.	
D		It is a socio-environmental impact business that produces a simple and effective alternative to plastic film (and aluminum foil) used in the conservation and sealing of utensils containing food in refrigerators, freezers, and cabinets, among other situations.	
E		This start-up aims to promote sustainability through waste disposal. It seeks to engage people and companies to encourage and incentivize them to be more conscious about their waste disposal.	
F	Mid-west	A company specialized in developing microorganisms for the production of chemicals using renewable raw materials, minimizing waste production and toxicity, and making the processes more efficient and safe ecologically. It seeks to increase the productivity allied to a sustainable process.	
G		This start-up proposes an easy way of building through structure, closure, and furniture modules of simplified assembly. All aspects are designed and manufactured with methods/tools of industry 4.0, Artificial Intelligence, and using materials from renewable sources.	

H	Northeast	The idea of this company is to produce native seedlings of the Caatinga biome, using species with ornamental value, as well as thematic landscaping using native species.	
I		This company operates in the segment of orthopedic immobilization (orthoses and prostheses) in PLA, moldable and biodegradable plastic.	
J	Southeast	A consulting company created by women for women specialized in project implementation and social actions aimed at black women in situations of extreme vulnerability.	

The cases presented in this study demonstrate how university-linked business incubators can contribute to transformative changes towards sustainable development by addressing the SDGs, as noted by Adams (2017), ICE (2019), and UNDP (2014). The results demonstrate that university-linked business incubators are catalyzers for sustainable entrepreneurship, confirming Scaramuzzi (2002).

The terms sustainability and impact business are already well conceptualized at incubators in Brazil (ICE 2019; ANPROTEC 2019). This study puts on the view that most Brazilian incubators are involved in developing impact entrepreneurship. Although there is a sustainability commitment, only one investigated Brazilian business incubator addresses SDGs and ESG in its strategic planning. The Inside ESG Tech Report (Distrito 2021) pinpoints 740 ventures providing ESG solutions (ESG techs) in Brazil, revealing the Brazilian potential for sustainable innovation.

5.3 Selection process of SOBIs

The sample for this step considered the listing of BIs recognized as sustainability-oriented. This study could point out different types of applications for tenants, such as contact by e-mail (4%), selection call with a deadline (32%), continuous flow call (36%), application platform via form (21%), submission of projects (7%).

Regarding the 21 Brazilian business incubators, the usual incubation selection process is through a public call. It means an official written act published for general knowledge or stakeholders (Ferreira et al. 2008). In Brazil, a public call is a mandatory instrument for activities carried out by government agencies. It confers legal character and makes the process transparent and impartial (Maintinguer 2004).

Worldwide, platforms for tenants' applications are popular. This continuous process allows flexibility in the entry of projects and start-ups during the year. A permanent application process enables BIs to have projects with different levels of maturity.

However, platforms are less transparent and more subjective about the criteria and ways of evaluation than public calls. On the other hand, this type of application is less undisguised than public calls.

No standard criteria for assessing sustainability-oriented new venture projects were identified. From the eight worldwide incubators and the 21 Brazilian BIs, sixty-seven criteria for selection were pointed out. Fourteen criteria (Table 7) present a relation with SOBIs principles (Brito et al. 2018). Figure 3 shows these criteria linked to the 17 SDGs and ESG factors.

Table 7 SOBIs criteria for applications, value creation capitals, and principles for SOBIs

Criteria	**Value creation capitals**	**Principles**
Environmental impact feasibility	Manufactured; Natural	Responsible production; Resources optimization; Impact concern; Employees awareness
Non-polluting production process		
Potentiality to generate intellectual property assets	Intellectual; Financial	Development of products, services, and sustainable technologies
Capacity to generate new technologies		
Scientific and technological feasibility and relevance		
Degree of innovation of products, processes, or services		
Expenditure on research, development, and innovation		
Technological need met	Intellectual	
Social impact feasibility	Human; Social and relationship	Population awareness; Honesty; Social justice; Ethics
Diversity in the organizational chart		Honesty; Social justice; Ethics
Counterpart of human resources		
Turnover		
Number of jobs to be generated		Social justice

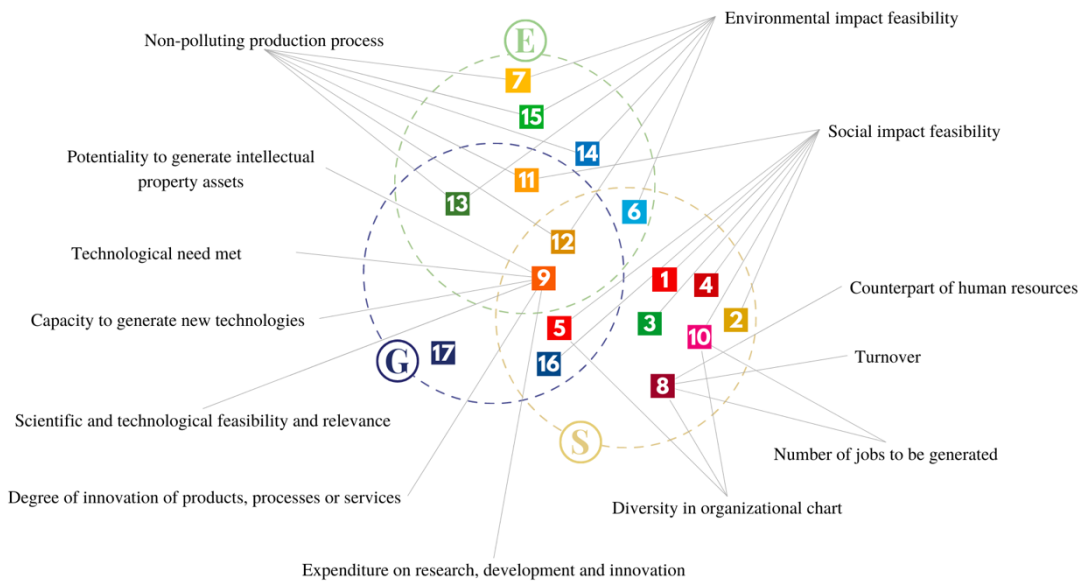


Figure 3 BIs' requirements and criteria for tenants' recruitment and the related SDGs and ESG factors

Source: authors

From the 29 SOBIs investigated, none of the tools used for selection are systematized to generate more concise comprehensions concerning the sustainability of the applicant tenants. Kanda and Bank (2015) and Bank et al. (2017) reveal that the analysed BIs also present gaps in new ventures' sustainability-oriented selection process.

6. Conclusions

This study aimed to investigate to which extend Brazilian and international BIs are sustainability-oriented. Even though there is a global trend regarding the role of business incubators in promoting sustainable development, the results showed few incubators are committed to the theme explicit. This study did not stress the scenario of incubators with this positioning. However, it pointed out the main incubators linked to universities in Brazil and worldwide that are focusing their proposition on promoting socio-environmental impact business with profits. This movement strengthens the role of universities in the hybrid innovation system called Quintuple Helix, a propulsive set to sustainable development.

The research findings pinpoint few worldwide-top business incubators demonstrate engagement in promoting sustainable innovation. The leading BIs ranking by UBI Global does not consider indicators of sustainable entrepreneurship development to evaluate BIs performance. This circumstance may not encourage business incubators from seeking the sustainability approach.

The results demonstrate that the top Brazilian business incubators have gotten involved with sustainability. This fact may be associated to the Impact Incubation and Acceleration Program, a national movement train BIs staff to shift their focus toward sustainability. This program has popularized the concept of SOBIs and impact BI in Brazil. It is making intermediary innovation institutions aware of their relevance in this context.

Although some business incubators are committed to promoting sustainability, only one BI from the sample mentions and addresses the issues of the 2030 Agenda in its website, documents, and publications. These findings demonstrate a disconnection between the incubators' motto with this globally guiding instrument of sustainable development.

The investigated BIs' application criteria were checked and linked to value creation capitals and principles of SOBIs, as well as classified considering ESG factors and the SDGs. Gaps in the selection process of new sustainable start-ups or ideas are evidenced by the findings. For example, sustainability criteria were missing.

This paper contributes to scientific gap concerning sustainability as orientation for BIs, especially university-linked ones. The limitation of this paper is the lack of information in the websites and documents of some top BIs worldwide and in Brazil.

In front of the findings, this study concludes that programs focused on preparing innovation agents for a sustainability approach may encourage and drive BIs in this pathway, reshaping traditional incubators models and turning SOBIs from fiction into fact.

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5. ARTIGO 02

University teaching staff and sustainable development: an assessment of competences

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Abstract: Teaching about matters related to sustainable development requires not only a personal motivation from educators, but also a variety of competences. This paper reports on a multi-country study, which aimed at identifying the level of importance given to desired competences on sustainable development by teaching staff at a number of higher education institutions. On the basis of the findings, the paper identifies the gaps and outlines some of the needs which should be addressed, via which competence building may help to foster the educational and societal transformation towards sustainability. The implications of this paper are twofold. First, it emphasises the value of and the need for competences on sustainable development. Second, it illustrates some of the needs which should be met to provide a framework among which competences on sustainable development may be further developed.

Keywords: Competences. University. Teaching staff. Sustainable development. Higher Education

1. Introduction: teaching sustainable development at universities

Universities have been assuming the traditional role of being leaders and mentors in society (White 2015), adapting themselves to new contexts and needs. Built on the ultimate aim to 'transform our World' (UN 2015), the UN document Agenda 2030 clearly reconfirms "ambition to strive for holistic, integrated, interdisciplinary education" (Lovren 2017), calling for all education institutions, and in particular universities, to contribute to this complex transformative process. A difficult mission has been assigned to Higher Education Institutions (HEIs) to prepare employable professionals for the knowledge based economy and, at the same time, to educate reflective citizens, who would contribute towards ending poverty, injustice and environmental and climatic degradation in the world. As such, there has been a renewed focus on identifying needed competences, especially those related to teaching and education outcomes (Rieckmann and Gardiner 2015; Levesque and Blackstone 2020). Meeting these highly demanding tasks requires reorientation of existing structures within the university, as well as a redefinition of the role of students, teachers, and researchers (Steiner and Posch 2006).

Further, universities need to develop sustainability-concerned citizens, not only through specific disciplines, but also in a general context approach, fostering learners to have impact in their personal and professional lives (Leal Filho et al. 2019a; Ruiz-Mallén and Heras 2020).

Bearing in mind the multidimensional process of education, teaching staff should not only support students in the "acquisition of competences that enable people to live and act in a sustainable way" (Dannenberg and Grapentin 2016, p. 8), but also develop their own sustainability competences. It is of special importance to support teaching staff in building Education for Sustainable Development (ESD) competences, which are described as a "teacher's capacity to help people develop sustainability competencies through a range of innovative teaching and learning practices" (Rieckmann 2018, p.56). By 'teaching staff' we are referring to the educators of varying ranks that teach at Higher Education Institutions. It is essential to prepare teaching staff to contribute to ESD (Taimur 2020; Albareda-Tiana 2019). Sustainable development (SD) and sustainability are two terms that can be approached differently (Axelsson et al. 2011) but both refer to management and governance mechanisms and the principles and processes for present and future generations to meet their needs (Olawumi and Chan 2018; WCED 1987). The terms are usually used interchangeably (Norton 2005), also as presented in the context of ESD competences (Rieckmann 2018). The spectrum of sustainable development competences is quite wide. It entails not only professional development in education and teaching, but also in respect of managing of institutions, curriculum development and monitoring and assessment of learning success.

While the implementation of the Sustainable Development Goals (SDGs) might be seen as another highly demanding policy request of universities, it can also be taken as a good opportunity for advancing the process of integration of SD into teaching and learning (Leal Filho et al. 2019a). There are recently developed guidelines for teaching staff to support in formulating and achieving learning objectives and outcomes related to all the SDGs and its targets, made under the framework of competences for sustainability and with the aim to provide recommendations for integrating ESD into teaching and learning at all the levels of education (UNESCO 2017). Creating an "enabling climate for teachers to participate in transformation of their teaching strategies within the 'whole institution' reforms, supported by the policy at the global, national and local level" (Lovren 2019, p.2) would offer a suitable environment for teaching staff to advance students' sustainability competencies as well. However, there are multiple barriers to the level of systemic change at Higher Education Institutions needed for this type of transformation of sustainability teaching practices (Blanco-Portela et al. 2017), including critical thinking as a contribution to accelerating implementation of SDGs (Leal Filho et al. 2019a),

This paper describes a multi-country study that explores the level of importance given to desired competences on sustainable development by teaching staff at a number of higher education institutions. More specifically, we ask, "How does teaching staff see and perceive their competences in sustainable development education?". Consistent with this objective, an overview of the literature about competences in SD teaching will be presented, followed by the

methods used in the study which collected data across a number of countries. Finally, the results of the quantitative research will be reported, analysed and discussed. On the basis of the findings, some conclusions are drawn.

2. Competences in Sustainable Development Teaching

Competence-based higher education enables students to acquire the important knowledge, skills, values, and attitudes that will be needed in their future professional and personal lives (Lambrechts et al. 2013). Rychen (2002) states that the use of competences contributes to improving students' assessment of the skills they acquire in addressing life's challenges, but also in setting important educational goals that improve lifelong learning systems and processes. Nevertheless, "competences are not based on any specific knowledge content, but rather more oriented toward questions of how the acquisition of the required competences can be made possible" (Holfelder 2019, p. 945). UNESCO (2017) proposed that ESD can contribute to achieving the SDGs and provided guidance on using it to support progress on Global Goals, developing cross-cutting sustainability competences to deal with sustainability challenges in each goal and integrate them.

There are many propositions about the key competences for sustainability as shown by Barth et al. (2007), Wals (2010), Wiek et al. (2011), Rieckmann (2012), Wals (2014), Gombert-Courvoisier et al. (2014) and Lozano et al. (2017). While there are some similarities in the competences suggested by these and other authors, the literature related to competences for sustainability is still dominated by "laundry lists" rather than conceptually embedded sets of interlinked ones (Wiek et al. 2011). Table 1 presents a compilation of the most commonly discussed sustainability competences, based on the literature.

Table 1 Compilation of competences in sustainability from selected peer-reviewed literature

Authors	**Sustainability competences**
Barth et al. (2007)	Seek interconnections, independence and partnerships; understanding cross-cultural cooperation for more flexible views; participation and capacity.
Wals (2011)	Think prospectively and to deal with uncertainty; work in an interdisciplinary manner; achieve open-minded perception; cross-cultural understanding and cooperation; participatory competency; planning and implementation competency; the ability to feel empathy; motivate oneself and others; reflect at a distance on individual and cultural concepts; and sympathy and solidarity.
Wiek et al. (2011)	Systems thinking, Strategic, Anticipatory, Normative and Interpersonal competence (across-cutting key competence in sustainability)
Rieckmann (2012)	Anticipatory thinking; interdisciplinary work; systemic thinking and handling of complexity; cooperation in (heterogeneous) groups; participation; planning and realizing innovative projects; empathy and change of perspective; ambiguity and frustration tolerance; critical thinking; acting fairly and ecologically; communication and use of media; and evaluation.
Wals (2014)	Competences to work in an interdisciplinary environment; acquire interconnections, interdependence and partnerships; flexible visions, cross-cultural understanding and cooperation; participatory competence; competence/capacity for planning and

	implementation; ability of empathy, sympathy and solidarity; personal motivation and among others; and understanding competence of distinct behaviour and cultural vision.
Gombert-Courvoisier et al. (2014)	Planning and implementation capacity; empathy, be nice and have solidarity; personal and group motivation; and understanding of distinct behaviour and cultural insight.
Lozano et al. (2017)	Seek interconnections, independence and partnerships; understanding cross-cultural cooperation for more flexible views; participation and capacity.
UNESCO (2017)	Think prospectively and to deal with uncertainty; work in an interdisciplinary manner; achieve open-minded perception; cross-cultural understanding and cooperation; participatory competency; planning and implementation competency; the ability to feel empathy; motivate oneself and others; reflect at a distance on individual and cultural concepts; and sympathy and solidarity.
Brundiers et al. (2020)	Systems thinking, Strategic, Anticipatory, Normative and Interpersonal competence (across-cutting key competence in sustainability)

Developing these competences among graduates is critical to the development of sustainability literacy (Cebrián and Junyent 2015), and can help students become positive agents for personal change and more effective professionals (Sipos et al. 2008). Some universities have created specific systems that address the suggestions made by international bodies (UNESCO 2015), discussing in depth competences for sustainable development in courses, professional development programs, community outreach activities and continuing education for all change agents, even for those who intend to pursue careers outside the university structure (Wals, 2014). However, the education for sustainable development (ESD) literature on sustainability competences has mostly focused on enabling learners to respond to local and global challenges. While there is a paucity of work that focuses on educators' competences to be able to teach and practice sustainability (Rauch and Steiner 2013), the last few years has seen growing attention to this topic (Uitto and Saloranta 2017; Vare et al. 2019, Roy et al. 2020).

Having the competencies to teach sustainable development requires teaching staff to go beyond being instructors of specific content, to becoming dynamic members of the classroom in which they engage in dialogue with students, their parents and the community (Sleurs 2008). For example, community-based learning can provide key learning experiences to students, and thus could be one of many specific pedagogical approaches for teaching staff to master (Deri 2001). Teaching staff must be able to encourage visioning of new solutions to current challenges, practice systems-thinking, engage students in directing their own learning, and prepare students to network with partners in and out of school (Roy et al. 2019; Sleurs 2008). To do this, teaching staff must themselves understand the complexities of sustainability, mediate the conflicting values and perspectives inherent in sustainability, create and critique differing transformative visions for society, and engage cooperatively with community actors (Rauch and Steiner 2013; Sleurs 2008). Bertschy et al. (2013) compare two models of teacher education competence development in ESD and find that both models highlight the demanding task of preparing teaching staff for this responsibility, and that doing so goes beyond typical didactic teacher training. In fact, competences for ESD cannot be simply communicated or taught, but must be learned through practice (Vare at al. 2019).

For teaching staff to enable students to achieve these competencies, Cebrián and Junyent (2014) developed a theoretical framework of professional ESD competencies and elaborated seven main components, as shown in Table 2. Teaching staff need to develop these competencies in their professional practice, in order to duly incorporate a sustainability dimension into the teaching-learning process.

Table 2 Professional competences in ESD

Categories	**Description**
Future/alternative scenarios visioning	Understanding the different scenarios, possible futures, promoting work with different visions and scenarios for alternative and future changes.
Contextualizing	Taking into account the different dimensions of a problem or action, the spatial dimension (local-global) and the temporal dimension (past, present and future).
Work and live with complexity	The ability to identify and connect the ecological, economic and social dimensions of problems. Generate the conditions for systems thinking in the school environment.
Think critically	Creating the conditions for critical thinking to question assumptions and to recognize and respect different trends and views in different situations.
Decision-making, participation and acting for change	Moving from awareness to action; sharing responsibilities and engaging in joint action.
Clarify values	Values clarification and strengthening behaviour towards sustainability thinking, mutual respect and understanding of other values.
Establish a dialogue between disciplines	Developing teaching and learning approaches based on innovation and interdisciplinarity.
Manage emotions and concerns	Promoting reflection on one's own emotions and as a means to reach a deeper understanding of problems and situations.

Source: Cebrián and Junyent (2014).

In the view of Cebrián and Junyent (2014), professionals should be able to envision future scenarios, understand the context and the complexity of problems, think critically, clarify values, work interdisciplinarily and manage emotions. To do so, teaching staff need to have sustainability competences themselves and be able to develop them within their learners (Vare et al. 2019). Table 3, based on experiences from the European School of Sustainability Science and Research (ESSSR) and the Inter-University Sustainable Development Research Programme (IUSDRP) which run a wide training programme on matters related to sustainable development, lays out a synthesis of the competences needed by sustainability teaching staff as discussed in the literature.

Table 3 Competences required of sustainability teaching staff

Competence	**Usefulness**
Knowledge of the subject matter	Allows a proper handling of sustainability issues in teaching programmes

Interdisciplinary thinking	Caters for due consideration to inputs from various areas and disciplines
Analytical capacity	Ability to understand connections between topics and contexts
Capacity to implement solutions	Support the problem-solving process
Ability to value varying perspectives	Shapes personal and collective identities and the formation of responsible citizenship
Commitment to SD	Demonstrates "doing by example" in respect to conservation of the environment, social responsibility, ethics and cultural diversity

Source: the authors

Further, the United Nations Economic Commission for Europe (UNECE 2015), has proposed that the competences for ESD should involve three foundations: professional development in education; government and administration institutions curriculum development; and monitoring and evaluation. To enable teaching staff to do this, the following methods should be applied to their training: learn to know; learn to live together; learn to do; and learn to be.

Vare et al. (2019) built on the UNECE (2015) and UNESCO (2017) frameworks for teaching competencies for SDGs to create a more manageable and practical set of competences for ESD called a Rounder Sense of Purpose (RSP). Using the same three main categories from UNECE: holistic approach, envisioning change, and achieving transformation, the RSP identifies 12 competences for ESD (Figure 1).

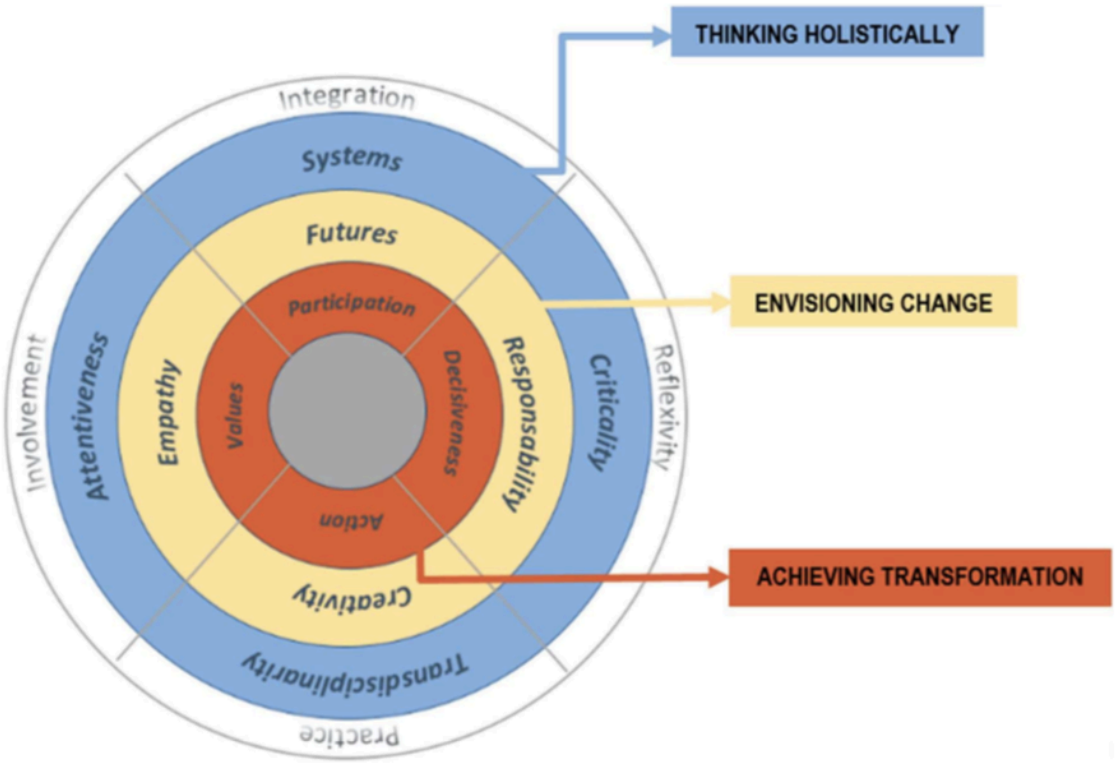

Figure 1 Rounder Sense of Purpose (RSP).
Source: Elaborated by the authors based on Vare et al. (2019)

This literature review on competences in Education for Sustainable Development reflects the growing interest in developing a converging set of key competences that can guide teaching staff. Yet, this literature review also attests to the complexity of defining such competencies. Attempts at creating a definitive list have proved to be very difficult (if not impossible) to achieve, primarily because of different ideologies, perspectives, contexts and priorities. Further, there appears to be no effort to date to assess the degree to which teaching staff value these ESD competences. It is unknown if teaching staff responsible for ESD are prepared for this task, or if there are some areas in which they are less capable than others. We address this gap in the literature by asking how teaching staff see and perceive the competences in sustainable development education.

3. Methods

Based on the diversity of views and perspective on competences, and the need to shed some light on the ways they are perceived and practised, an international survey was designed, in order to assess the extent to which teaching staff value competences in education for sustainable development. It was partly based on the UNECE's list of Competences in Education for Sustainable Development (UNECE 2012). As per this document, the set of competences listed represents a goal for all educators. Combined, they may work as a framework for professional development. A summary of this framework of competences is presented in Figure 2.

Figure 2 Framework of competences for ESD used for the survey
Source: Based on UNECE (2012)

This model was chosen as a departure point, however the individual items making up the instrument reflected other elaborations of the model, such as the RSP palette proposed by Vare et al. (2019). However, in contrast to what Bertschy et al. (2013) suggest, the research instrument featured items focusing on personal behavior and lifestyle towards sustainability as

the research team considered these as crucial elements at the heart of the hidden curriculum within each educational institution.

The survey had five sections: one for each group of competences and one for collecting demographic details about the respondents (country, how many years of teaching and areas taught). The four main sections had in total 52 statements to which the respondents used Likert Scale to indicate their levels of agreement and importance. The end of the questionnaire provided an open space for respondents to add comments or suggestions, if desired. Apart from the details from each person, the instrument asked about the areas they teach, and list various competences teaching staff should have.

The instrument was pre-tested by five sustainability specialists with expertise and numerous publications in the area of sustainability in higher education. The main comments were connected to style and wording and these were useful to adjust the survey accordingly. After this pre-test, the survey was sent out to members of the Inter-University Sustainable Development Research Programme (IUSDRP) which includes more than 150 participating universities in different countries and represents a network of universities which have been collaborating together on sustainable development research. This group has been participating in various studies related to sustainability in higher education (Leal Filho et al. 2019b; 2019c). The online survey was sent out using the Google Forms tool and the invitation to participate in the study clearly stated it was directed to teaching staff working at higher education institutions. Additionally, the first questions were related to years of experience in teaching and main areas taught, which would prevent students and staff from responding.

The survey remained active for two months (October and November/2019) and in addition to the first invitation, three reminders were sent out during this period. In total, 120 respondents completed the survey. The countries of origin of these participants are presented in Figure 3 and include: USA (n=23), Brazil (n=18), UK (n=9), Portugal (n=8), Germany (n=7), Australia (n=5), Serbia (n=4), Spain (n=4), Belarus, Chile, China, Colombia, Ghana, Guatemala, India, Italy, Malaysia, Sweden, Zimbabwe (each with n=2), Bangladesh, Canada, Croatia, Greece, Hungary, Iran, Israel, Jamaica, Japan, Kenya, Liberia, Malta, Nigeria, North Macedonia, Norway, Qatar Sri Lanka, The Netherlands, Switzerland and Uganda (each with n=1). The number of responses can be considered a limitation of this study; for this reason, future studies may replicate this research to not only compare the results, but also investigate a larger sample.

Figure 3 Countries represented in the survey

Figure 4 presents a summary of the years of experience in teaching and areas taught for the sample. Most of the respondents have been teaching for more than 10 years (68.3%) and the main two areas are Social Science and Business.

Teaching for:	
Categories	*Average (%)*
Less than 1 year	1.7
Between 1-5 years	11.7
Between 5-10 years	18.3
More than 10 years	68.3
Area(s) you teach:	
Categories	*Average (%)*
Social science	34.45
Business	20.95
Humanities	13.5
Engineering & Technology	12.15
Natural Sciences	9.45
Health	2
Others	7.5

Figure 4 Sample details on the teaching experience

The results, outlined in the next section, are presented using descriptive statistical analysis, based on mean and standard deviation tests with support of the software SPSS. For the mean, Likert Scale results were scored from 1 to 5 (e.g. Very low importance = 1; Low importance = 2; Medium Importance = 3; High importance = 4; Very high importance = 5). The results also report the percentage of respondents who selected each response in the Likert Scale. For a full view of the nature of data collected, the instrument used is placed as an Appendix.

4. Results and discussion

The first group of results relate to the category of 'Learning to know' in which educators report on their competence regarding the degree to which they understand sustainability knowledge (Table 4) and value related teaching practices (Table 5). Overall, teaching staff report high general sustainability knowledge, especially in relation to: the interrelationships between organisms and physical environment (1), the connection between social and environmental issues (2), the cause-effect relationship between consumption and poverty (4), the need for political will and investment to achieve SD (7), and the change of unsustainable practices aiming at a better future (9). Similarly, teaching faculty found related teaching practices to have high or very high importance, with the highest percentage of respondents valuing student encouragement (15) and application of concepts to real world problems (20).

Table 4. Level of agreement with statements about 'Learning to know – sustainability knowledge'

Variable	Percentage of respondents					Mean	Standard Deviation
	Strongly disagree	Disagree	Don't know	Agree	Strongly agree		
1. Ecological systems are a set of interrelationships between various organisms and their physical environment.	4.2	2.5	1.7	29.2	62.5	4.43	.967
2. Issues of poverty, hunger and social inclusion should be addressed separately from environmental protection studies.	59.2	28.3	2.5	5.8	4.2	1.67	1.06
3. Limits on growth must be imposed, because the resources on our planet are finite.	0.0	15.0	2.5	42.5	40.0	4.07	1.01
4. Excessive consumption in one part of the world is causing poverty in another.	1.7	7.5	12.5	29.2	49.2	4.16	1.02
5. Development decisions should be based on scientific evidence rather than cultural concerns.	5.0	32.5	20.0	33.3	9.2	3.09	1.10
6. Sustainable development is an evolving concept.	3.3	4.2	3.3	39.2	50.0	4.28	.963
7. Achieving sustainable development requires political will and investment.	3.3	0.8	1.7	17.5	76.7	4.63	.894
8. Citizens have no power if governments do not promote sustainable practices.	13.3	44.2	11.7	17.5	13.3	2.73	1.27
9. Changing unsustainable practices today ensures a better quality of life for the future.	4.2	2.5	4.2	25.0	64.2	4.42	.992
10. Science and technology provide all the solutions needed to solve problems caused by unsustainable development.	33.3	40.0	5.0	13.3	8.3	2.23	1.27

11. Social sustainability is achieved by overcoming differences of race, gender, class, generation, skills and beliefs.	8.3	11.7	22.5	34.2	23.3	3.52	1.21

Table 5. Level of importance given to 'Learning to know – teaching practices'

Variable	Percentage of respondents					Mean	Standard Deviation
	Very low importance	Low importance	Medium importance	High importance	Very high importance		
12. Learning about your students' interests	0.0	3.3	26.7	39.3	30.8	3.97	.844
13. Encouraging your students to question what they are being taught.	0.0	1.7	11.7	39.2	47.5	4.32	.746
14. Promoting problem solving.	0.8	0.0	4.2	40.8	54.20	4.47	.660
15. Encouraging students to be creative and seek new ways to resolve issues.	0.0	0.0	6.7	35.0	58.3	4.51	.621
16. Structuring your teaching around your students' experiences.	0.8	1.7	30.0	39.2	28.3	3.92	.851
17. Changing educational structures to promote more learner autonomy.	0.0	2.5	21.7	41.7	34.2	4.07	.811
18. Trying new learner-centred pedagogies that enhance learning (e.g. project based learning)	0.8	1.7	14.2	38.3	45.0	4.25	.822
19. Prepare students to meet new challenges in the unforeseen future	0.0	0.0	10.0	44.2	45.8	4.35	.658
20. Applying concepts to real world problems	0.0	0.0	1.7	25.8	72.5	4.70	.491
21. Engagement in place-based learning	0.0	2.5	25.8	30.8	40.8	4.10	.873
22. Giving equal learning opportunities for people with disabilities	1.7	1.7	15.0	29.2	52.5	4.29	.901

These first sets of results suggest that survey respondents were themselves familiar with sustainability concepts and teaching practices that are discussed in the literature on ESD competences. Our results suggest that teaching faculty do acknowledge the relevance of competences for ESD for them as teachers. This finding is consistent with other previous studies have identified, such as Rychen (2002) and Lambrechts et al. (2013), as ESD competences acquired will help them to promote a problem-solving approach (items 14 and 15), by applying concepts to the real-world problems.

The second set of results is related to the category of 'Learning to do' in which the educator is able to do things such as create participatory and learner-centered learning opportunities (Table 6). Survey respondents felt that it was very important to do all of the identified teaching practice (all statements had Likert means higher than 4.20), and the statement with the highest score (4.54 Likert mean) was the use of real-world events as a source of learning (29). Again, these results imply that the teaching staff that responded to our survey are familiar with the value of pedagogical approaches identified in the literature as important for ESD. Others have found

that, in practice, these learner-centered pedagogical approaches are essential for development of student sustainability competence (Roy et al. 2019).

Table 6. Level of importance given to 'Learning to do'

Variable	Percentage of respondents					Mean	Standard Deviation
	Very low importance	Low importance	Average importance	High importance	Very high importance		
23. Communicating a sense of urgency to take action for a sustainable future	0.0	5.8	9.2	39.2	45.8	4.25	,852
24. Evaluating the potential consequences of decisions and actions	0.8	3.3	6.7	45.0	44.2	4.28	,801
25. Fighting prejudice and preconceptions.	0.0	5.0	14.2	28.3	52.5	4.28	,890
26. Exploring issues from different (e.g. cultural, religious, social) perspectives	0.0	4.2	15.0	34.2	46.7	4.23	,857
27. Inspiring hope when faced with the problems caused by unsustainable practices	0.0	0.8	17.5	39.2	42.5	4.23	,764
28. Becoming a change agent in your community	0.0	0.0	15.8	36.7	47.5	4.31	,733
29. Using real-world events as a context and source of learning	0.0	0.8	4.2	35.0	60.0	4.54	,620
30. Framing local issues with global concerns	0.0	0.8	10.0	40.8	48.3	4.36	,697
31. Anticipating and responding to change	0.0	3.3	8.3	48.3	40.0	4.25	,747
32. Learning from past experiences	0.8	1.7	9.2	37.5	50.8	4.35	,786

The third set of results is related to the category of 'Learning to live together' in which the educator is able to work with others and develop partnerships in ways that engage different stakeholder groups (Table 7). These statements had lower Likert means compared to the other categories of questions. The statement with highest mean (4.21) was the promotion of dialogues about different worldviews in the classroom (37). These results suggest that while teaching staff still see the importance of these concepts, they are relatively less valued than the other competences queried in the survey. And yet active collaboration with stakeholders is a well-established tenant of addressing sustainability challenges; faculty must have the competence to prepare their students in this realm (Yarime et al. 2012).

Table 7. Level of importance given to 'Learning to live together'

Variable	Percentage of respondents					Mean	Standard Deviation
	Very low importance	Low importance	Medium importance	High importance	Very high importance		
33. Collaboration with other people within your own department/faculty.	2.5	5.0	14.2	39.2	39.2	4.11	.861

34. Collaboration with other people from different departments/faculties within your institution.	0.0	4.2	19.2	34.2	42.5	4.07	.980
35. Collaboration with other people from different institutions.	0.0	4.2	19.2	34.2	42.5	4.07	.981
36. Challenging unsustainable practices at your educational institution.	2.5	4.2	19.2	36.2	37.9	4.18	.809
37. Promoting dialogues about different worldviews in the classroom.	0.0	1.7	13.3	46.7	38.3	4.21	.735
38. Encouraging student acceptance of multiple ways of knowing.	8.0	6.7	20.8	35.8	35.8	3.99	.957
39. Facilitating student consultation and engagement with the various stakeholders involved in an issue.	1.7	6.7	23.3	27.5	40.8	3.99	1.03
40.Promoting student engagement (e.g. project activities) with different groups (e.g. ages, ethnicity, cultures, beliefs).	0.8	1.7	13.3	45.8	38.3	4.19	.791

The fourth and final set of results is related to the category of 'Learning to be' in which the educator, themself, is inclusive of different perspectives, motivated to make a positive contribution and inspires creative innovation (Table 8). Again, the survey respondents found all the educator characteristics to be important, with only slight differences in the average Likert scores among various statements. These results imply that teaching staff who responded to this survey were personally committed to the development of their own inclusivity, engagement, motivation and critical learning, among other qualities.

Table 8. Level of importance given to 'Learning to be'

Variable	Percentage of respondents					Mean	Standard Deviation
	Very low importance	Low importance	Medium importance	High importance	Very high importance		
41. Being inclusive of different disciplines, cultures and perspectives.	8.0	1.7	13.3	45.8	38.3	4,19	,791
42. Inspiring creativity and innovation.	0.0	8.0	6.7	41.7	50.8	4,42	,656
43. Being a critically reflective practitioner.	0.0	1.7	5.0	33.3	60.0	4,51	,673
44. Engaging with learners in ways that build positive relationships	1.7	0.0	12.5	39.2	46.7	4,29	,813
45. Accepting indigenous knowledge as a valid contribution to decision-making.	1.7	5.8	21.7	35.0	35.8	3,97	,982
46. Feeling motivated to take action to improve the quality of life of other people locally.	0.0	2.5	15.8	40.8	40.8	4,20	,794
47. Feeling motivated to take action to improve the quality of life of other people globally.	0.0	1.7	20.0	41.7	36.7	4,13	,787
48. Challenging assumptions underlying unsustainable practice.	0.0	0.0	10.8	42.5	46.7	4,35	,671
49. Seeking opportunities for self-directed learning.	0.0	2.5	17.5	37.5	42.5	4,20	,815

50. Questioning (including personal) beliefs and assumptions.	0.0	3.3	13.3	40.0	43.3	4,23	,806
51. Being sensitive to the feelings and emotions of people during decision making.	0.0	1.7	16.7	41.7	40.0	4,20	,773
52. Fostering partnerships (internal-external)	2.5	1.7	11.7	37.5	46.7	4,24	,907

Comments from the open space offered in the survey provided additional insight into respondents' experiences of teaching sustainable development. The use of practical activities seems to be a positive approach (including guest lecturers and study visits) but support of partnerships was stated as necessary for successful implementation of SD teaching (especially in the context of vulnerable populations and engagement in programs organised by developed countries). Challenges included keeping students interested and motivated; the desire to be a creative professor while having a comprehensive, mandatory curriculum; little institutional support for changing practices (e.g. provision of training, rewards for engagement on competence building or advice on how to achieve transformation); and the economic crisis.

Throughout the survey, the majority of teaching staff identify all items as either high importance or very high importance. For this reason, the analysis below first concentrates on those answers with a lower standard deviation from the Likert mean, and then focuses on the responses that had a higher standard deviation from the Likert mean.

The variables with the lowest standard deviation from the Likert mean indicate statements with the highest level of agreement among all respondents. In our study, teaching staff seem to have the highest agreement with some of the competences proposed by Cebrián and Junyent (2014). For example, these results highlight the importance teaching staff give to 'future/alternative scenarios visioning' and 'contextualizing', as seen in their agreement with competences to apply concepts to the real-world problems (Table 5 [to know], item 20), use real-world events as a context and source of learning (Table 6 [to do] - item 29), promote dialogues about different world views in the classroom (Table 7 [to live together] - item 37), and frame local issues with global concerns (Table 7 [to do] - item 30). The category 'think critically' from Cebrián and Junyent (2014) is also confirmed, as teaching staff encourage students to be creative and seek new ways to resolve issues (Table 5 [to know] - item 15), encourage students to be a critically reflective practitioner (Table 8 [to be] - item 43), and inspire creativity and innovation (Table 8 [to be] - item 42).

Other survey statements had higher standard deviations, indicating that teaching staff responded with a greater spread along the Likert scale. Questions 34 and 35 (Table 7 [learning to live together]) and 52 (Table 8 [learning to be]) had the highest standard deviations. Rieckmann (2012) describes these ideas as a competence in 'cooperation in (heterogeneous) groups', and the present research indicates inconsistent agreement with importance of developing this ability among teaching staff. A further example is question 45 (Table 8 [accepting indigenous knowledge as a valid contribution to decision-making]). To Wals (2014), one of the sustainable

competences is 'understanding competence of distinct behaviour and cultural vision', but not as many teaching staff respondents agreed that this competence is important to their teaching.

While we cannot comment on how educators acquired their knowledge and attitudes or the degree to which they have mastered them, we can surmise that they are largely self-taught given that most respondents are teaching from longer periods of time; in other words, it is unlikely they received formal training in sustainability or sustainability education, unless the HEI where they teach provided this opportunity. This is supported by Vare et al (2019) who suggest that educators acquire and enhance ESD competences throughout one's career, and not during a brief process. These results also suggest that for those educators that are motivated, it is not necessary to have the institutional-level, full-system support for preparing educators as suggested in the literature (e.g. Lovren 2019; Bertschy et al. 2013; Wals 2010).

Our study also found that teaching faculty equally value knowledge and teaching practice competences; the 'Learning to Know' competences, for example, did not score any higher than the 'Learning to Do' competences. Again, this is in contrast to the literature that assumes there is a greater focus on the acquisition of sustainability knowledge compared to sustainability pedagogy (Vare et al. 2019). Teaching staff in the field of sustainability recognized the value of teaching methods such as deliberative dialogue, problem-based learning, and community-based learning, among others.

5. Conclusions

The objective of this study was to identify the degree to which teaching staff value and perceive competences in education for sustainable development at higher education institutions around the world. Our literature review provided a robust description of the competences needed for teaching about sustainable development that center around learning to know, learning to do, learning to be and learning to live together in relation to knowledge of sustainability problems, interdisciplinary and analytical thinking, developing solutions, and recognizing diverse values.

Taken as a whole, our results suggest that survey respondents, who currently teach sustainability, are highly aware of and in agreement with the concepts behind the ESD competences groupings proposed by UNECE. Competences related to application of concepts to real-world problems scored especially high, suggesting that teaching staff recognize the value of using context-specific, engaged learning in ESD. Competences with relatively lower scores and greater standard deviations were related to fostering partnerships and engaging students with stakeholders. Given the stakeholder-based, solutions-oriented nature of addressing sustainability problems, this suggests a potential key gap to fill. Perhaps better institutional support for teaching staff to learn from and engage with local community issues would help establish more confidence and ability in this particular pedagogical approach.

We also suggest that because many of the teaching staff that responded to this survey have been teaching for over 10 years, that they may have acquired these competences over time, primarily

through their own initiative. We acknowledge that this implies that some faculty may not require full institutional embrace of ESD in order to gain needed competences. However, these teaching staff may be considered to be 'early adopters' who could be instrumental in helping develop methods for training new teaching staff who are less motivated or experienced to build their ESD competences. These master teachers could be surveyed for a more detailed analysis of the ways in which they developed their knowledge and competences, challenges they have faced, and suggestions they have for training new educators. Further, these experienced ESD educators could be tapped for leading competence-based teacher training webinars, and for connecting one-on-one as peer mentors to new sustainable development teachers.

As this paper has outlined, 'Future or alternative scenarios visioning' or 'contextualizing' are among some of the most popular competences, as teaching staff apply concepts to real-world problems. The use of real-world events as a context and source of learning is also another means via which competence for ESD can be furthered. In respect of the opportunities in the process of teaching sustainable development, it can be seen that practical activities are regarded as positive procedures, and this may include not only guest lecturers and study visits but also hands-on experiments. The role of partnerships was also regarded as an important one in the successful implementation of SD teaching, although 'Learning to live together' competences were slightly undervalued compared to the other categories.

As far as challenges are concerned, keeping a sustained interest and motivation from students interested against a background of curriculum obligations and limited institutional support are elements which may hinder the process. In order to address them and to move forward, it is suggested that conventional teaching on matters related to sustainable development be supported by more interactive elements such as:

a) Webinars on sustainability issues

b) Podcasts on the selected themes on campuses or outside them

c) Internet-based exercises students may perform and report on

Many other methods could be added to this list. Indeed, digital-based technologies may not only make the teaching more interesting to students, but may also foster other skills along the way, such as IT-skills, the ability to process varied sets of data, or caters for a view "out of the box" in which a national or even international dimension may be added to the advantage of an "active learning" process. In addition, a "project-based" approach to SD learning, which is known to be effective (e.g. Leal Filho et al. 2016), may be successfully deployed to the advantage of competence building.

This paper has some limitations. Firstly, the survey's focus on ESD competences is quite specific and respondents may be those with a greater pre-existing interest in this topic. We acknowledge that this likely influences our results related to the overall high experience of respondents with the competences. Secondly, respondents who teach in the Social Sciences and

Business were overrepresented in our sample, while those from engineering and natural sciences are not well represented. Thus, we do not know for certain if our results hold across teaching staff from all types of disciplines; there may be some fields in which faculty are more likely to have mastered the ESD competences than others.

Despite the above limitations, the paper provides a timely and useful contribution to the literature. It reports on an international study focusing on competences involving a set of 120 respondents from 40 countries and all five continents and appears to be the first study that assesses teaching faculty perceptions of competences for ESD. This study involved not only rich countries such as Germany, England, Italy, Norway, and the United States, but also developing countries such as Brazil, Bangladesh, Guatemala, and Zimbabwe, among others.

A final lesson from this study is that sustainability teaching competence building, while primarily done on an individual, 'ad hoc' basis, could be made stronger if prominently placed as one of the learning objectives in graduate courses and in degree programmes. Also, competence building can be strengthened if it is paralleled by capacity building at HEIs. Access to training and capacity building programmes may allow them to better address and respond to the challenges of teaching sustainable development. Additional studies could explore methodologies for establishing a more nuanced ESD competence rubric, although doing so across multiple disciplines and countries may not be reasonable, since sustainability education is context-specific.

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6. ARTIGO 03

The potential of university-led incubators in fostering sustainable development

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Abstract: Incubators play a critical role in launching new businesses, often in collaboration with their graduates. Universities have the potential to promote knowledge and innovation within the framework of sustainable development. While there is a substantial body of literature on business incubators and their contribution to entrepreneurial development, and a significant number of studies examining universities' role in promoting sustainable development, there is a lack of research specifically focused on the sustainability aspects of new businesses supported by university-linked incubators. This paper addresses this gap by conducting a survey of 17 international universities from various countries, identifying the extent to which their business incubators prioritize and incorporate sustainable development into their activities and services. The study also identifies the benefits of promoting sustainable development and the main barriers that hinder its implementation in incubators. The findings underline the importance of integrating sustainable development into the strategies, services, and activities of business incubators. Additionally, the paper offers recommendations to help universities better incorporate sustainable development into the start-ups they support.

Keywords: sustainability – incubators – businesses – universities – cooperation.

Highlights:

- Few incubators fully consider environmental and social impacts.
- Ethical considerations and educating the team are reasons to incubators promote sustainability.
- For some incubators, sustainability is a marketing opportunity.
- Lack of expertise and materials/resources is the main barrier to implement sustainability in incubators.
- Literature lack on sustainability in business created with university support.

1. Introduction: Sustainable development at universities

From the prominent Brundtland Report (WCED 1987), over 30 years the sustainable development approach has become increasingly trendy (Mensah 2019; Atkinson et al. 2014). In short, this catchphrase is composed of a set of principles which means to meet the needs of the current generation without compromising the ability of future generations to meet their own needs (WCED 1987), integrating economic, environmental, and social fields for development (Kolk 2016). For sustainable development pursuit, different actors need to be involved, as well as understand their fundamental role in every human activity (UNESCO 2009).

For a long time, education has been recognised as the centre of sustainable development realization (Shulla et al. 2020; Burbules et al. 2020), and higher education is a noteworthy enabler in fostering sustainability (Mintz and Tal 2018; Shiel et al. 2015). Quality education contributes to accelerating capacity to implement sustainable development (UNESCO 2016). The UN Agenda 2030 devotes a specific goal for Education for Sustainable Development based on principles to prepare citizens to cope with and find solutions for sustainability issues (UNESCO 2005). The targets of the Sustainable Development Goal 4 claim universities to be part of the Agenda, by means of experience besides their core of learning and teaching, but also addressing their research, innovations, and extension (UN 2016; Lambrechts and Hindson 2016; Ávila et al. 2017). Over the past two decades, universities have been urged to become more accountable to the wider public and to contribute directly to the local, regional and national development through taking on a range of "third mission" activities (Hassan 2020) and even before the launch of the Global Goals, universities have concentrated on setting up sustainability offices in order to promote the application of social and environmental projects on campuses, thereby creating awareness among learners and employees of sustainable development issues (Leal Filho et al. 2019).

In parallel with their primary mission to teach and conduct research (Sánchez-Barrioluengo and Benneworth 2019; Soetanto and Van Geenhuizen 2019), universities of the XXI century have third and fourth missions of covering all activities related to the generation, use, application, and exploitation of knowledge and skills outside academia (Buil-Fabregà 2018; Hassan 2020). Universities have a fundamental role in generating innovation, boosting knowledge framed within the model of sustainable development (Buil-Fabregà 2018) particularly and recently in order to build more resilient societies after the COVID-19 pandemic (UNEP and IRP 2021). All these new demands have changed universities and made them more entrepreneurial and responsibly innovative in nature (Sánchez-Barrioluengo and Benneworth 2019; Soetanto and Van Geenhuizen 2019), including activities as the incubation of start-up firms, knowledge commercialization, the development of knowledge transfer partnerships and providing entrepreneurship courses (Hassan 2020).

When based on sustainable development, the universities' mission can compose a virtuous circle, developing new capabilities which help to build new and sustainable business ideas, as well as nurturing dynamic, unpredictable, and long-term changes (Build Fabregá 2018). Higher

education is not part of a stand-alone SDG; it is an important player for all other 17 goals in one way or another (UNESCO 2017). Besides SDG#4, universities can support SDG#8 ("to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all") and SDG#9 ("Encourage the promotion of small start-ups to ensure sustainable industrial development"). In this sense, universities have focused on changing their organizational structures to support regional development by supplying skilled labour, developing new knowledge and technology and making them available to local organizations, and rolling out (new) start-ups (Wakkee et al. 2018).

Noted there is substantial literature concerning higher education and sustainable development, in terms of sustainability initiatives and commitment (Leal Filho et al. 2021; Lozano et al. 2015; Ramos et al. 2015), barriers, challenges, and drivers (Leal Filho et al. 2017; Aleixo et al. 2018), impacts assessment (Findler et al. 2018; Vykydal et al. 2020), along with others. Even with the notable range of studies in the scientific field regarding sustainable development and universities, research that evaluates universities' aspects in inclusive, responsible, and sustainable innovation is in its infancy. Ávila et al. (2019) came up with barriers to sustainable innovation in universities and how they can overcome these challenges. The authors emphasise the need to seize opportunities to contribute through innovation to achieve the SDGs. Arocena and Sutz (2021) explore a first glimpse of the potential contributions of universities to social innovation as a sponsor for sustainable human development. Nowiński and Haddoud (2019) and Buil-Fabregà (2018) unfold innovative and entrepreneurial universities may create a good policy mix that encourages sustainability in new ventures (start-ups and spin-offs). Entrepreneurship development with university support is an important social trend, as well as a contributing factor towards the Sustainable Development Goals (SDG) (Theodoraki et al. 2018; Barral et al. 2018; Mititelu et al. 2017). In this regard, Rinaldi et al. (2018) state within third- and fourth-mission activities, universities can play different and broader roles (generative, absorptive, collaborative, and leadership), in the figure of university-linked innovation enablers as technology transfer offices, scientific parks, and business incubators.

All this trend makes universities key players in solving our society's major challenges, by changing the strategic course of action from just teaching and conducting research, to innovation and finding ways to create value by applying their research results, offering good opportunities for pursuing sustainable development (Holgersson and Aaboen 2019). Within this frame of reference, this study sheds some light on the identification of to what extent university-linked business incubators take sustainable development into account and the benefits and barriers of fostering SD for these incubators.

2. The role of incubators in fostering sustainable development

New ventures formed by leveraging a core technology or a technology-based idea developed within universities may play a critical role in driving technological innovation, job creation and economic stability (Hossinger et al. 2019; Hayter 2016). Universities are the source of knowledge, research, resources and innovation-driven centres (Hassan 2020). Start-ups can

locally contribute to the economy's dynamism (Antonietti and Gambarotto 2020), nurturing significant social, economic, environmental and technological impacts (Rodríguez-Gulías et al. 2018). As well, young businesses are important for urban resilience, whereas they may easier restart in case of failure (Lose and Tengeh 2015) or recover from a crisis as the one COVID-19 pandemic has triggered (Uwaegbulam 2020).

A business incubator has an important role in stimulating the economic growth of the small and young businesses, as well as promoting a positive effect on their technical and financial indicators (Thodoraki et al. 2018; Cumming et al. 2019; Peters et al. 2004; Olkiewicz et al. 2019). Incubators stimulate entrepreneurship by providing resources, services, and networking opportunities for start-ups to promote ideas and technological innovation. The objective ultimately is to develop a successful entrepreneurship into a new financially viable, well managed and commercially positioned business, what can help young business to overlap the "valley of death" and reduce the rate of the corporate bankruptcy (Hernández and Carrà 2016; Shih and Aaboen 2019; Stal et al. 2016; Al-Mubaraki and Busler 2013). The "valley of death" is a perilous period for young business, before it reaches a breakeven point and incubators have a crucial role to support start-ups to lap over this transitional phase (Natsheh et al. 2021).

Stayton and Mangematin (2019) explored three mechanisms offered by incubation and acceleration programs that sped up innovative venture and are tied to increasing entrepreneurial orientation in the start-up technology firm: survival (starting up quickly is a matter of survival), resource network (starting up quickly requires leveraging pre-existing networks) and catching up (accelerators fill gaps to allow inexperienced entrepreneurs to start up quickly). Incubators may support in reducing the failure rate of business by providing different services, such as information about successes and failures in the past, market conditions, available technology, and a network of suppliers of different services that facilitate the development and implementation of new ideas (Ndedi 2009; Lose and Tengeh 2015; Theodoraki et al. 2018). Business incubators can support the development of new technology companies by helping them build credibility, shorten the learning curve, solve problems faster, and by providing access to entrepreneurial networks (Hisrich and Smilor 1988; Antonietti and Gambarotto 2020). Lasrado et al. (2016) suggested the impact of business incubation on new venture viability may be contingent on the type of support offered by an incubator, as well as the attributes of business environments within which incubation services are provided.

Depending on the geographical region and types of research focus, different types of incubators are defined (Barbero et al. 2012). For instance, in Italy, von Zedtwitz and Grimaldi (2006) classify incubators as a regional business which can be physical or virtual, independent commercial, or a company owned by the university. In Spain, incubators are classified as basic research incubators, university business incubators, economic development incubators, and private incubators (Barbero et al. 2012). Despite all previous definitions, the typology of Aernoudt (2004) is well accepted. He states that incubators, following economic criteria, can be classified as mixed incubators, economic development incubators, technology incubators, social incubators, and basic research incubators; although Olkiewicz et al. (2019) states that

nowadays, technology incubators are the most common type. It is important to have a useful incubator typology, not only to assess incubators' performance in different regions but also to define funding policies (Barbero et al. 2012).

Apart from the incubator's typology, business incubators usually focus on specific sectors. According to Bone et al. (2017), some sectoral focuses of incubators are non-specific digital technology (including Internet of Things - IoT and big data), life sciences, education engineering and manufacturing, health and wellbeing, energy, environment, food, electronics, among others, independently of their funding source. The incubation process is distinctive and depends on each incubator's purpose, goal and focus (Aurmo 2010).

Key tangible and intangible resources, such as social capital and business knowledge, can be provided by incubators (Kenan Institute 2020). As incubation progresses, according to the incubators' type or focus, different types of resources are provided, influencing significantly and positively the early development of the firms and graduation performance. This fosters entrepreneurship and improves the ability of resident firms to gain access to key resources and advice that they are not able to provide directly for themselves, reducing failure of these new businesses (Aurmo 2010; Xiao and North 2017; Khalid et al. 2018).

These offered services are physical resources (low-cost office space or virtual space, internet access, conference rooms, and other shared facilities), human resources (incubator's management team and staff including knowledge and experience in legal, accounting, financial, marketing, management and intellectual property advice, training and qualifications, presentation skills development), technology resources (support for products and services development, laboratories, technology capabilities, and skills), financial support (support for applications for fundraising and venture capital), and organizational resources (planning, coordinating, monitoring, routines, commercializing technology, relationships, and networking support) (Somsuk and Laosirihongthong 2014; Shih and Aaboen 2019; Anprotec 2018; Stal et al. 2016; Bank et al. 2017; Al-Mubaraki et al. 2013). In addition to these resources, technological business incubators associated or managed by universities typically offer access to scientific knowledge resources (Xiao and North 2017).

University affiliation is an important contingency that affects the relationship between firms' participation in incubators, and their subsequent performance (Lasrado et al. 2016). As a player in the innovation ecosystem, business incubators are perceived as important mechanisms for sustainable development as they involve relevant stakeholders and key activities which they use to interact with each other (Hernández and Carrà 2016; Hoogendoorn et al. 2019). They can also support start-ups in the formation and improvement of business, creating a positive intervention to booster start-ups involving economic, social and environmental development factors, and promoting sustainable entrepreneurship (Theodoraki et al. 2018; Buil-Fabregà 2018). Many universities have begun to encourage incubated start-ups to transfer research results to society, thereby contributing to the Sustainable Development Goals (SDG) in a more meaningful way (Reichert 2019).

The 2030 Agenda recognizes science, technology, and innovation as drivers for addressing its goals and targets, as they can facilitate work addressing global and local challenges such as efforts to eradicate poverty (SDG 1), achieve food security and nutrition improving agriculture (SDG 2), facilitate access to energy and increase energy efficiency (SDGs 7 and 9), combat diseases (SDGs 3 and 6), improve education (SDG 4), protect the environment (SDGs 11, 12, 13, 14 and 15), accelerate the economic transformation (SDG 8 and 9), improve productivity and competitiveness (SDG 12) and support sustainable and inclusive development (as this can simultaneously create social inclusion and environmental sustainability) (UN 2016). Even though some sustainability initiatives were manifested at the level of the associated science (i.e. research and innovation parks linked to universities), this is not exclusively seen as a holistic strategy incorporated into business incubators or science, research or innovation parks (Aurmo 2010).

Business incubators in developed and developing countries face several challenges (Cullen et al. 2014), including the fact their services stress mainly the importance of enterprise management and market-oriented operation (Li 2016). Little is known about how incubators are taking on this task, nor how entrepreneurs have been incorporating sustainability principles into their business projects in this space (Fonseca and Jabbour 2012; Brito et al. 2014) especially given that social and environmental sustainability is far from a concern of incubators' coordinators (Brito et al. 2014). Business incubators haven't defined documents, policies, and objectives related to sustainability practices, and it has not been analysed as being systematically integrated into incubators' operations and activities (Aurmo 2010).

Business incubators have to increase their relevant role in fostering and encouraging the inclusion of sustainable development issues on the agenda of entrepreneurs', through assessment standards and selection criteria that considers the socio-environmental viability of the business as a determining factor for its approval (Cardoso et al. 2008; Brito et al. 2014), as well nurture the concern in addressing sustainability aspects into the young business' core. Based on this, business incubators have a greater potential to uphold sustainable development thought sustainability-oriented new ventures.

3. Material and methods

3.1 Study design

The study aimed to get empirical insights into what extent university business incubators consider and emphasize sustainable development, as well their potential in foster SD through their supported ventures. University-led incubators are defined as the organisations that provide support for early-stage client start-ups in becoming viable and scalable business and derive their business objectives primarily from one or more universities (UBI 2019; Barbero et al. 2012). In order to achieve this research's aim, the methodology was divided in two stages: an analysis of publicly available information and secondary sources (i.e. websites and reports) and an online-questionnaire on Google Forms to derive rich information about the incubators.

3.2 Stage 1

As the study is explorative by nature and does not aim to theorize or draw generalizable statements about the entire population, non-random sampling seemed appropriate. Convenience sampling and purposeful sampling strategies were combined for this research. Purpose sampling was used to select information-rich and experienced representatives of incubators (Palinkas et al. 2015). In order to identify the convenience sampling, the UBI Global Ranking (2017/2019) Report was used. The UBI Global World Rankings of University-linked Business Incubators and Accelerators is the main classification for business support organisations (more than 700 incubators from more than 70 countries) and it is part of World Benchmark Study launched by the UBI Global – Innovation Company and Community.

This study evaluates the performance and best practices of the business incubators, supporting them to understand their role into the global innovation ecosystem (UBI 2019). The uppermost business incubators were pinpointed, the top-five university-managed incubators and top-five university-affiliated business incubators in the world. According to UBI Global (2019), an incubator managed by university is the one directly operated by one or more universities and incubator affiliated with university means the one that is not directly operated by but is formally affiliated with one or more partner universities based on contractual agreement.

Classical content analysis was carried out for analytical approach of the collected information (Yin 2005). ATLAS.ti was the software used for qualitative data analysis in order to organize raw data (Bazeley 2013).

3.3 Stage 2

In the second stage, a survey instrument was developed. A battery of items was developed by the team of authors to ensure comprehensiveness and to avoid redundancies. The instrument comprised 27 items and was divided into two parts. The first part of the questionnaire was used to collect general information about the incubators (e.g. type, number of start-ups and percentage of successful, thematic focus, among others). Regarding the type of the incubators, the following categories were queried: universal (e.g. covering all areas), technology-oriented, focused on social issues, focused on services, sustainability-oriented and an “other” category. In addition to the typology, another question related to the sectoral focus, as it is suggested by the literature that the main focus of incubators is IT, life sciences/biotech and engineering (see for the UK: Bone et al. 2017). In complementary, the second part focused on business incubators processes and aspects’ relation to sustainable development.

The survey was then piloted and pre-tested by a panel of co-authors as well as two incubators (University of Passo Fundo and GründungsService). The pre-test results were allowed by the responders to be included in the final sample and result.

From October 2019, up January 2020, the top business incubators were invited to take part in the online-survey (time, tool, N=10, n=1). Due to the low response rate, a convenience sampling from a population was adopted, which seemed to be easier to contact and reach (Given 2008). Hence, for the second stage of the field phase, the invitation was extended to another 107 university-managed and affiliated incubators from the UBI Global Ranking list (2017/2018) (N=107, n=5). Considering the focus of the study was university-led business incubators, the list of members of Inter-University Sustainable Development Research Programme was searched for universities with incubators, which were contacted and invited to participate (N=40, n=5). Additionally, the participants of the World Incubation Summit 2018 were invited (N=28, n=3). Other business incubators were approached via personal contacts and by a web-search (n=5).

In total, a set of 17 incubators from 12 countries took part in the study. From them, six incubators are listed in the UBI Global Ranking (2017/2018), meaning they are among the best incubators in the world. Table 1 shows the countries investigated and the focus of each BI. While this paper does not analyze the responses by country, the study included incubators from 12 different countries, making it an international investigation.

Table 1 Overview on incubator profiles

Code	Country	Profile Information
I1	Australia	Multi-sector accelerator program
I2	Austria	Multi-sector approach, ICT, materials and industrial processes, environment/energy/transport, life sciences, mechatronics, creative industries and other technologies
I3	Brazil	Multi-sector approach
I4	Brazil	Multi-sector approach, focus on health and IT/software
I5	Brazil	Technology-based business incubator, no specific focus, no specific website available
I6	Brazil	Looks unspecific, health-technologies and artificial intelligence; sustainable focus
I7	Chile	Mobility, urban logistics and the environment; tourism industry, agricultural development and renewable energy (not exclusive)
I8	Ethiopia	Multi-sector approach, technology-driven innovations
I9	Germany	Multi-sector approach
I10	Germany	IT security
I11	Italy	Multi-sector approach
I12	Portugal	Multi-sector, focus on technological innovations
I13	Portugal	Biomedical sciences, bio-engineering, biotechnology, biochemistry, pharmaceutical sciences, medicine, vision, industrial chemistry or computer engineering
I14	South Africa	Multi-sector, precision agriculture; biotech, synthetic biology, human therapeutic proteins, IT, IT security, online marketing services, eco-tourism; urban organic waste to clean energy technology, biogas
I15	Spain	Multi-sector approach
I16	Taiwan	Membrane technology, mold and molding technology, nanotechnology, medical engineering, precision technology and cultural/creative design and so on
I17	Uganda	Agribusiness with sustainability orientation

Although it is difficult to calculate a quantitative response rate concerning the total target population of incubators, it is obvious that the response to the invitations was below 10%.

However, the decisive factor for the research undertaken was not statistical representativeness, but the absence of distortions about the features that were significant for the research question (Kelle and Kluge 2010). It can be assumed that relevant combinations of characteristics are sufficiently represented in the sample.

GENES and Rbio were the softwares used for statistical analysis performing (Cruz 2016; Bhering 2017). Pearson's linear correlation was used to understand the association trend among the variables, using a significance based on 5% probability by the T test (Ferreira et al. 2022). Partial Components Analysis method was used to visualize the general variability of the experiment and the multivariate trends (Fraga et al. 2015). Subsequently, a dendrogram was constructed using the UPGMA clustering method, representing the dissimilarity between the business incubators.

The findings were summarized and the information was enriched with information derived from publicly available information, which allows us to answer the research questions.

4. Results and discussion

4.1 World's top university-led incubators

The top-five university-managed and the top-five university-affiliated business incubators are presented in Table 2. The listed incubators are from European and North American countries. Among these countries, Mexico and Tukey are considered emerging market economies and they present subdeveloped countries' features. The other top incubators are located in countries which present characteristics of development.

Table 2 Some of the world's top university business incubators

	UBI Ranking	**Business incubator**	**University**	**Country**
University managed	#1	DMZ	Ryerson University	Canada
		SETsquared	Universities of Bath, Bristol, Exeter, Southampton, Surrey	United Kingdom
	#3	PoliHub - Startup District & Incubator	Polytechnic University of Milan	Italy
	#4	University of Toronto Entrepreneurship	University of Toronto	Canada
	#5	Incubadora de Alto Impacto del Tecnológico de Monterrey (TCLEAN)	Instituto Tecnológico y de Estudios Superiores de Monterrey	Mexico
University affiliated	#1	1871 - Chicago's Technology & Entrepreneurship Center	Northwestern University; University of Chicago; Illinois Institute of Technology, University of Illinois; DePaul University	United States
	#2	YES!Delft	Delft University of Technology	Netherlands
	#3	ITU Çek irdek - ITU SEED (ITU CEKIRDEK)	Istanbul Technical University	Turkey
	#4	Uppsala Innovation Centre	Swedish University of Agricultural Sciences; Uppsala University	Sweden

	#5	Instituto Pedro Nunes	Universidade de Coimbra, Instituto Politécnico de Coimbra	Portugal

Table 3 provides information on the year of foundation and performance of the top university-led incubators worldwide. The oldest incubator on the list is the Swedish business incubator Uppsala Innovation Centre, which has been operating since 1999. The most recently founded incubators are 1871 – Chicago's Technology & Entrepreneurship Center and ITU Seed. Six of the listed incubators have been operating for more than 15 years, indicating their maturity. In terms of investments and seed funding, SETsquared is the top performer, having raised over £1.8 billion.

Table 3 Some facts and figures of the world's top university business incubators

Business incubator	**Year of foundation**	**Performance**
DMZ	2010	- More than 500 founders - 330 incubated start-ups - 424 graduated start-ups - $715 million in seed funding - More than 3,874 jobs
SETsquared	2002	- Over 3,500 companies - Over 20,000 jobs - Over £ 1.8 billions of investment - Over £ 0.75 billion raised by companies in the last 4 years
PoliHub	2000	- €30 million accumulative start-up turnover
University of Toronto Entrepreneurship	2009	- More than 500 companies - 1 billion in investment
Incubadora de Alto Impacto del Tecnológico de Monterrey (TC LEAN)	2004	- 360 graduated start-ups - 45 incubated start-ups - 85% of survival
1871 - Chicago's Technology & Entrepreneurship Center	2012	- Home of 500 early-stage, high growth digital start-ups
YES!Delft	2005	- Leading tech incubator in Europe - Over 200 tech start-ups - Nine focus areas
ITU Çek irdek - ITU SEED (ITU CEKIRDEK)	2012	- 1.8 funded entrepreneurs - 45 incorporated start-up
Uppsala Innovation Centre	1999	- Over € 408 million in the form of investments, grants and loans - 1011 start-ups and growth companies
Instituto Pedro Nunes	2002	- 75% of survival - €80 million annual turnover - Over 2000 jobs - Over 200 start-ups

Furthermore, the success stories of start-ups and ventures from the top university incubators demonstrate the effectiveness of these institutions. Table 4 presents some of these cases.

Table 4 Some of success cases from the world's top university business incubators

Incubator	**Start-up name**	**Description and products**
DMZ	Cinch	Enterprise data collaboration platform, where business and IT work together to create a cross-application data network and unlock unprecedented business agility.

	Hostaway	Hostway is the world's leading vacation rental customer relationship management software.
	Casalova	Real estate marketplace designed to simplify the customer experience.
SETsquared	Grid Edge	Puts intelligent control into the hands of commercial energy consumers.
	Interface Polymers	Polymer blending, joining and finishing.
	AccelerComm	Semiconductor IP-core company that provides patent pending channel coding solutions for communication standards.
PoliHub	Greenrail	Innovative and eco-friendly railway sleeper
	Zehus	Promotes human-propelled and smart mobility and commuting alternatives.
	Ileaf Space	Simplifying access to space via a service tailored for nano, micro and small satellites.
University of Toronto	Atomwise	Patented the first deep learning technology for structure-based small molecule drug discovery.
	Kepler Communications	Provides internet services for space assets by developing a constellation of data relaying satellites that will effectively act as on-orbit cell phone towers.
	Blue J Legal	Uses machine learning and artificial intelligence to bring clarity to the law issues.
TCLEAN	Thinkers	It is an enterprise to support students and professionals in different academic levels through particulars classes, programs to strengthen study habits and specializes courses
	Bio Solutions	It develops and produces bioplastic compounds of natural fibbers that reuse by-products of the agave industry as well as other sources of biomass with the aim of offering biomaterials for the plastics industry.
	Alebrije Estudios	Develops videogames and applications for mobile devices.
1871	Caremerge	Operational platform that connects families, residents and staff.
	Catalytic	Works to simplify and humanize the world of business software,
	Spothero	Paves the way for millions of drivers to easily find affordable parking in major U.S. cities.
YES!Delft	Epyon (ABB)	Battery-charging products and services for optimized fast charging of electric vehicle batteries, serving customers across Europe.
	Ampelmann	Providing the access solutions for people and cargo transfer.
	Night balance	Addresses the need for effective, more comfortable treatment options for sleep apnoea.
ITU Çek irdek - ITU SEED (ITU CEKIRDEK)	Logiwa	Cloud-based warehouse and inventory management software for warehouse management.
	Axolotlbio	Creates high-resolution desktop 3D bio printers and bio inks capable of producing functional three-dimensional living tissues.
	Hangaarlab	Developed V-Sight, an industrial augmented reality software platform
Uppsala	Sigrid Therapeutics	Pioneers a user-friendly medical product made of engineered particles with absorptive capacity.
	Sun Labs	Specialises in AI development, data visualization in real-time for solar cell facilities and other sustainable energy sources.
	Bitroot	A dashboard gives farmers live data from the sensor modules, while machine learning and AI will increase the performance in the background.
Instituto Pedro Nunes	Feedzai	Platform powered by artificial intelligence and big data.
	Critical Software	It provides systems and software services for safety, mission and business-critical applications
	WIT Software	Specialises in advanced solutions for mobile telecommunications companies.

4.2 University-led business incubators and sustainable development

Figure 1 presents a correlation network arranged by Pearson's correlation coefficients, which reveals 45 correlations among the research variables. This analysis shows which variables are linked and tend to influence each other.

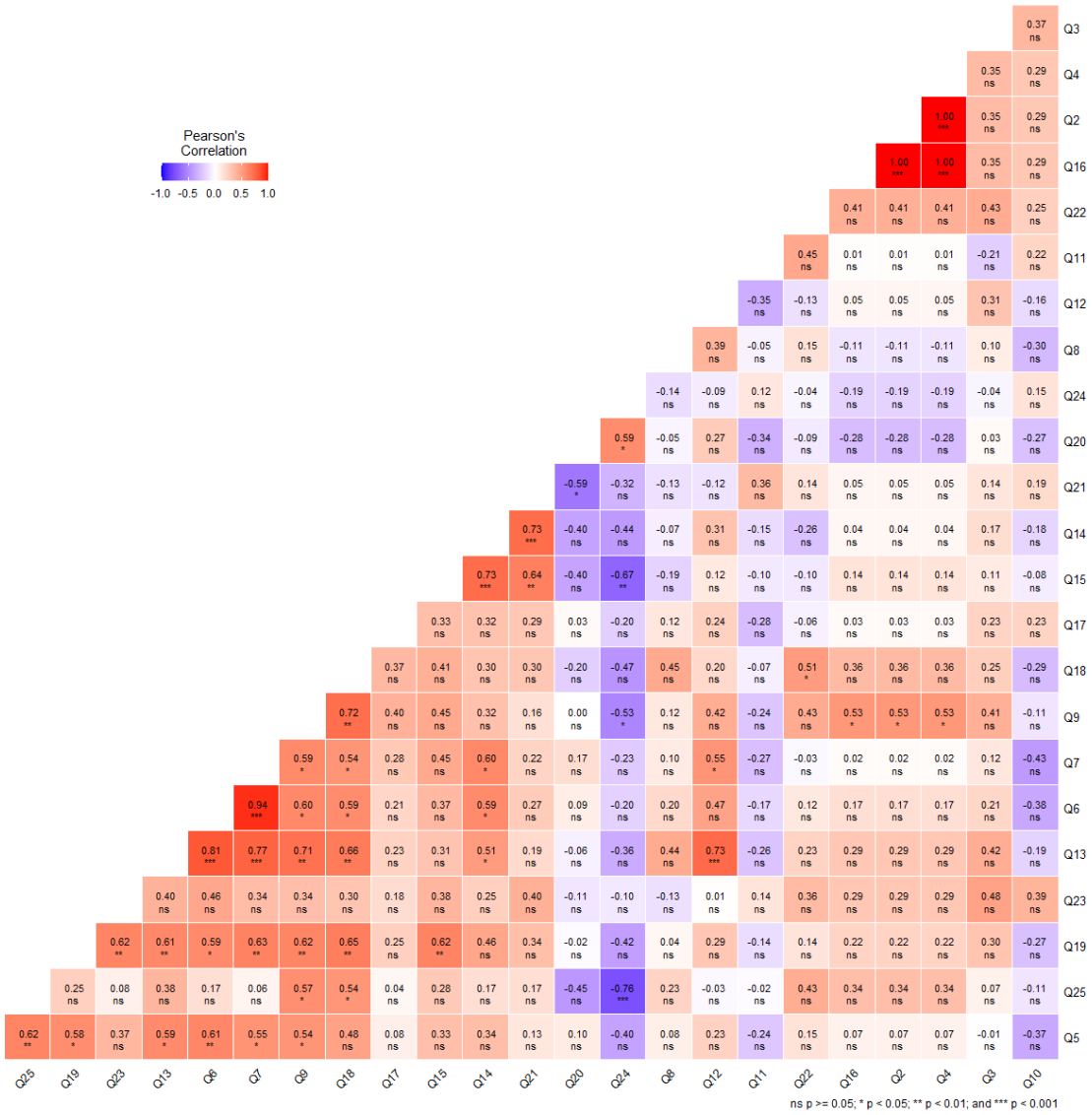

Figure 1 Correlation network for the variables (questions)

Regarding the sole variable associated with sustainable incubation, a positive correlation with 5% (<0.05) and 1% (<0.01) of statistical significance by T-test could be diagnosed in the pairs presented in Table 5, forming a linear association profile.

Table 5 Positive variable correlation

p-value	**Pairs**		**Pearson's correlation coefficient**
< 0.05	Q18 x Q22	Evaluation of social and environmental impacts x drivers to promote sustainability	0.51 – moderate positive
	Q18 x Q25	Evaluation of social and environmental impacts x types of initiatives related to sustainable development	0.54 – moderate positive

	Q20 x Q24	Awareness of the UN 2030 Agenda for Sustainable Development x promotion of initiatives related to sustainable development	0.59 – moderate positive
< 0.01	Q15 x Q21	Places for sustainable start-ups x activities linked to the UN 2030 Agenda	0.64 - moderate positive
	Q15 x Q19	Places for sustainable start-ups x promotion of SD learning activities	0.62 - moderate positive
	Q19 x Q18	Promotion of SD learning activities x evaluation of social and environmental impacts	0.65 - moderate positive
	Q19 x Q23	Promotion of SD learning activities x barriers to promoting sustainability	0.62 - moderate positive

The results show that evaluating the social and environmental impacts of new businesses enables greater clarity of the drivers that encourage sustainable entrepreneurship (Theodoraki et al. 2018; Wakkee et al. 2018). Moreover, this evaluation is directly connected to initiatives that promote sustainable development, especially Education for Sustainable Development. The probability of conducting a socio-environmental evaluation of start-ups may be related to the size of the incubator, considering the number of incubated companies and graduated companies.

Another study's indication might be that incubators that evaluate sustainability issues of new ventures, as well as promote Education for Sustainable Development (ESD) actions for tenants, tend to present higher rates of survival in Death Valley. Incubators seemed to help start-ups reduce their rate of failure. These results reinforce the statement that incubators may support reducing the failure rate of start-ups by providing different services and information (Ndedi 2009; Lose and Tengh 2015; Hernández and Carrà 2016; Shih and Aaboen 2019; Schwartz and Hornych 2010; Stal et al. 2016; Al-Mubaraki and Busler 2013).

Most of the incubators from the sample are aware of the UN 2030 Agenda for Sustainable Development and its goals and targets (SDGs). From the correlation network for the variables, the findings suggest the greater the incubator's knowledge about the UN 2030 Agenda, the more the offer of initiatives focused on sustainable development occurs, such as sustainability learning and activities oriented towards the SDGs. Likewise, the promotion of ESD actions to incubatees enables the identification of possible barriers to be overcome. The listed initiatives for sustainable development in business incubators were energy-saving programmes, waste management programmes, sustainable procurement, and water management programmes. The higher the number of vacancies offered to start-ups with a focus on socio-environmental impact per year, the more incubators perform SDG and ESD-related activities. Figure 2 presents some results for the variables.

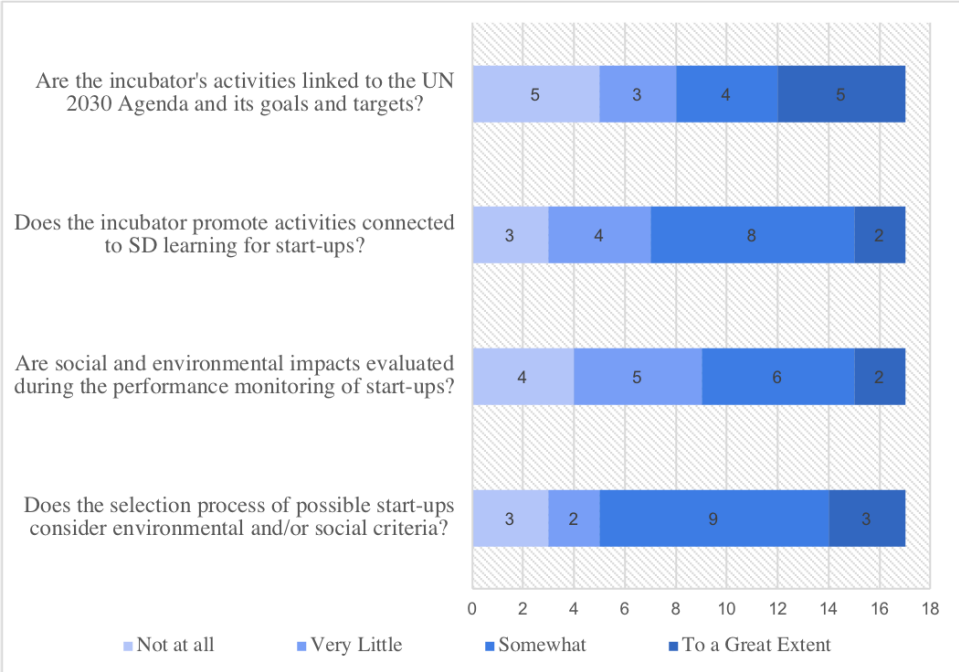

Figure 2 Implementation of Sustainable Development (SD) in incubators

A multivariate analysis was conducted to compare the incubators and identify similarities or differences between them. The biplot graphic provides a clear visualization of the behaviour of the phenomenon of interest by associating samples, variables, and variances. Figure 3 shows the Biplot PCA1 x PCA2 for the survey questions and the business incubators.

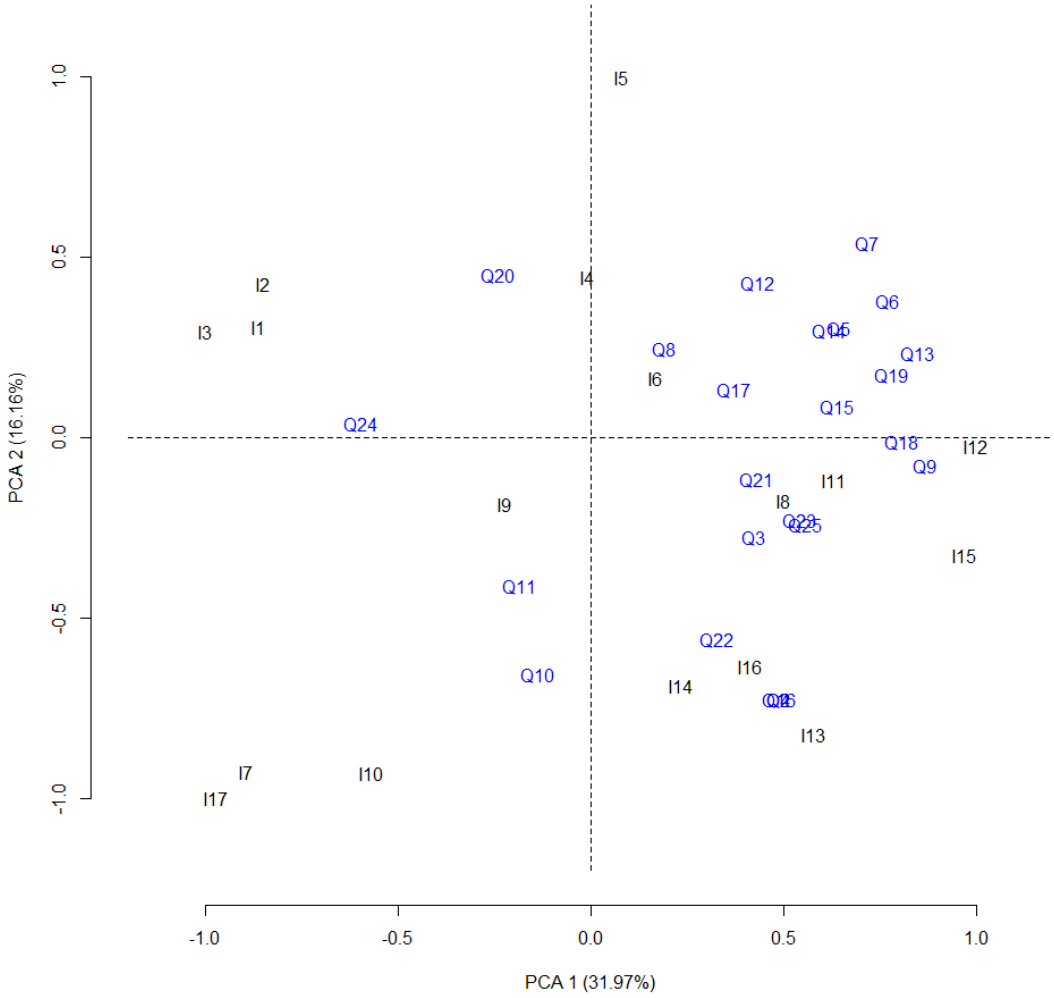

Figure 3 Biplot PCA1 x PCA2

At least 70% of the total variance must be explained by the first and second principal components (Rencher 2002). The sum of PCA1 and PCA2 components explained 48,13% of the total data variation (Figure 3). Observing the quadrants, the findings assume that incubators I1, I2, and I3 have an affinity with the Q24, pursuing specific initiatives related to sustainable development. Most of the incubators from the sample are aware of the UN 2030 Agenda for Sustainable Development and its goals and targets (SDGs). However, I4 has a linear combination with Q20, demonstrating awareness of the UN 2030 Agenda for Sustainable Development and its goals. The incubators I8 and I11 are aligned with Q21, promoting the incubator's activities linked to the UN 2030 Agenda. The incubator 11, together with I12, have closeness to Q18, regarding the evaluation of start-ups' socioenvironmental impacts.

The incubator I6 is close to Q15 and Q17, demonstrating its selection to adopt sustainability criteria, as well as this BI provides specific places for start-ups with a focus on socio-

environmental impact. Evaluation of social and environmental impacts during the performance monitoring of start-ups and promoting activities connected to SD learning for start-ups are positively correlated. It seems incubators are considering somewhat the inclusion of social and environmental criteria in their decisions, as previous studies pointed out (Cardoso et al. 2008; Brito et al. 2014; Bank et al. 2017).

Even offering incubation places for socio-environmental-oriented ventures, most of the incubators which took part in the study were rather universal (coverage of all areas) and/or technology-oriented, confirming the findings in previous studies in the UK (Bone et al. 2017). Olkiewicz et al. (2019) state that nowadays technology incubators are the most common type. The main focus listed is information, communication, and technology (ICT), biotechnology, 4.0 industry, climate and environment, food, and agribusiness. There is a positive correlation between evaluating social and environmental impacts during start-up performance monitoring and promoting SD learning activities for start-ups.

The distinctions between the business incubators were analysed using a dendrogram to cluster them and identify similarities and dissimilarities (Figure 4).

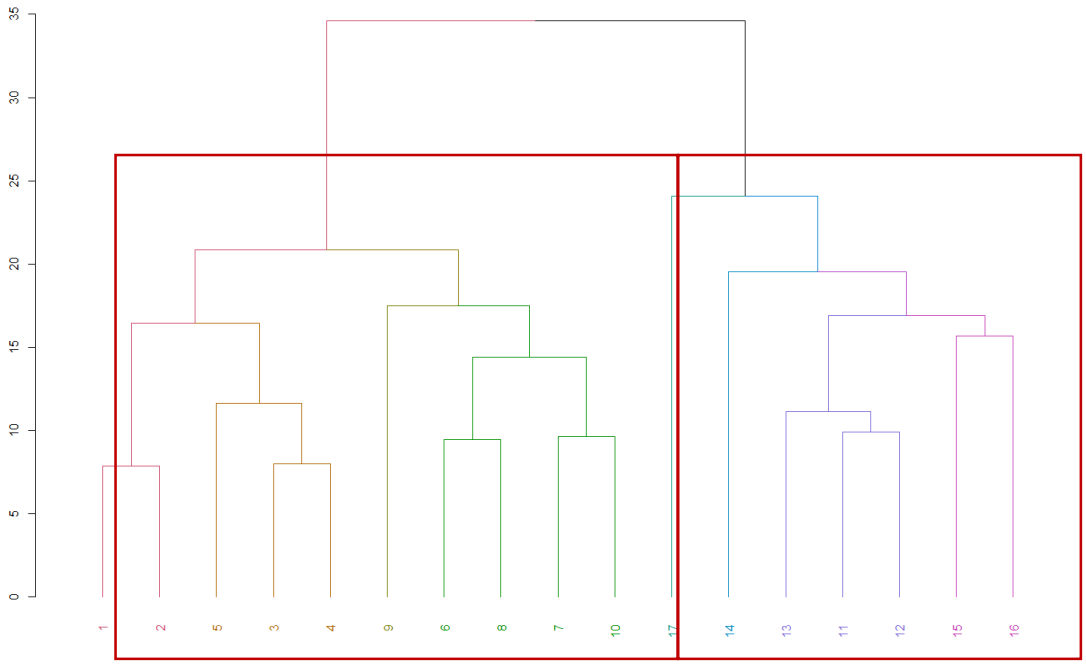

Figure 4 Dendrogram representative of the dissimilarity between business incubators.

According to the dendrogram, which identified a total of two large clusters, five subgroups were distinguished. Group 1 differed from group 2 in their responses to questions about offered services, challenges, and drivers for implementing sustainable development.

The majority of the incubators offered a wide range of services such as support for applications for fundraising and venture capital (17 incubators), coaching and mentoring and networking support (both by 16 incubators), and intellectual property advice (15 incubators). Previous authors defined these services as resources offered by incubators (Somsuk and Laosirihongthong 2014; Shih and Aaboen 2019; Anprotec 2018; Stal et al. 2016; Bank et al. 2017; Al-Mubaraki et al. 2013). This research sheds light on establishing a scale of the services more and less offered by incubators that need to be extended in future works.

Figure 5 shows the main reasons for the incubators to promote SD as a part of their operations as well as the main challenges to implementing SD in the incubators' process. A large majority (n=14) gave ethical considerations as the main reason for an incubator to promote sustainable development. Another important reason was to educate a sustainable team (n=13), followed by marketing opportunities (n=10) and legal compliance (n=9). The most related barriers to the implementation of SD in the incubator were a lack of material resources (n=11) and a lack of funding (n=9). Another important barrier identified was a lack of expertise (n=11), indicating the importance of Education for Sustainable Development (Leal Filho et al. 2019). These findings are consistent with the results of studies by Fonseca and Jabbour (2012), Brito et al. (2014), and Hernández and Carrà (2016), who also identified material resources, funding, and expertise as significant barriers to implementing sustainable development in business incubators.

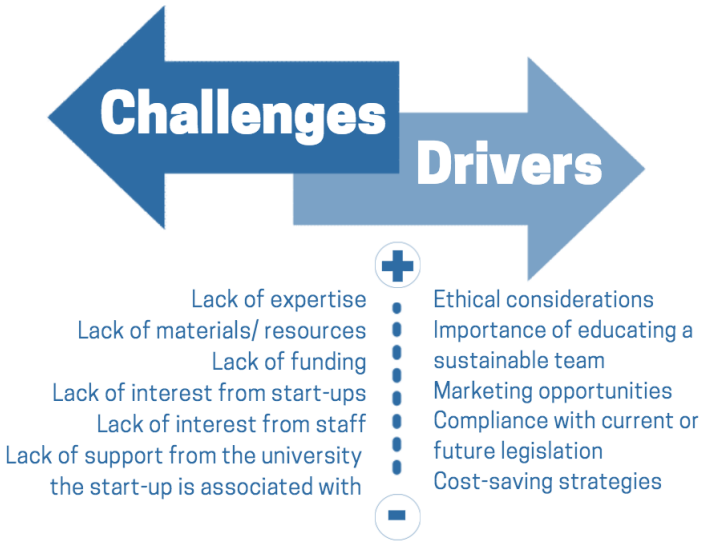

Figure 5 Drivers and challenges to promote SD in incubators

5. Conclusions

The study aimed to investigate the extent to which incubators prioritize sustainable development, and the survey instrument deployed provided a useful set of data.

As this paper has shown, many universities around the world act as incubators, and are helping them to overcome the problems seen in the first stages (hence overcoming the "valley of

death"). Also, many have a technological orientation. The variety of services they cover is also a good sign, since it shows a wide coverage of areas of economic and societal interest.

The results show that few incubators fully consider environmental and/or social criteria and impacts in their operations, with the predominant initiatives being physical resource management. The main reasons for incubators to promote sustainable development are ethical considerations, educating a sustainable team, and marketing opportunities. Lack of expertise and lack of materials and resources seem to be the main barriers hindering the implementation of sustainable development in incubators. The most predominant initiatives in incubators are the physical management of resources such as energy, water, and waste, with some emphasis also being given to procurement.

While the research has limitations due to the small sample size, it provides a welcome addition to the literature on the connections between sustainability and new businesses. The paper was not meant to cluster responses among specific countries, but to build a general profile instead, the purpose has been achieved.

The present paper nonetheless provides a welcome addition to the literature since it addresses the problem posed by the limited amount of published research on the connections between sustainability and new businesses, created with university support. Also, the fact that incubators from 12 countries took part in the study means that it is a truly international study.

Recommendations for incubators to better take into account sustainable development include emphasizing the importance of businesses in achieving the SDGs, building relationships between incubators, and providing structured information on sustainability. Staff at incubators should also be made more aware of sustainability practices and their social implications. Ultimately, sustainability should be a matter of global concern for incubators. Overall, the study highlights the need for greater consideration of sustainability in incubators.

Declarations

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7. ARTIGO 04

How university-led incubators perceive sustainability as an orientation? Fish to fry or a white elephant?

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Technovation
Status: Desk review

Abstract: University-based business incubators are elements of applied business education and crucial innovation environments that support and nurture new ventures. Entrepreneurship and innovation have the potential to catalyze resilient and sustainable development. Sustainability-oriented business incubation is a new incubators archetype and an emerging topic with little address in the scientific field yet. This paper explores how university-led business incubators perceive and approach sustainability in their operations and initiatives. For this purpose, the study utilized a qualitative approach to collect data from multiple case studies to gain in-depth knowledge and understanding of sustainability as an orientation for university-led BIs. For data collection, structured interviews were carried out with managers or staff from Brazilian, German, and Portuguese BIs deemed suitable for the study. After a content analysis to organize and elicit meaning from the data, the results indicated causal drivers that stimulate BIs to follow this orientation and strategic and sustainability-oriented initiatives they have already taken to get the "fish fried". The study highlights challenges faced by BIs in implementing sustainability-oriented incubation programs to prevent ineffective or wasteful outcomes, it means a white elephant. A new generation of BIs is proposed based on the results to encourage further academic interest in sustainability-oriented BIs.

Keywords: Sustainability-oriented – Content analysis – Sustainable development – Business incubator

Highlights:

- ESG funds and Agenda 2030 are paramount drivers for sustainability-oriented business incubators.
- BIs have to shed light on the challenges of not becoming a white elephant.
- BIs need to be part of innovation ecosystems.
- Reshaping the university-led BIs model is required to get the fish fried.

1. Introduction

University-led business incubators have evolved beyond physical spaces, now offering business support services such as coaching, professional services, and networking in exchange for membership or monthly fees (InBIA, 2017). Business incubators (BIs) help and accelerate new ventures or entrepreneurs to grow their business (Carvalho and Galina, 2015), reducing the risk of start-ups failing in the early years (Soetanto and Jack, 2016) and granting them access to valuable knowledge and services (Bruneel et al., 2012; Hausberg and Korreck, 2020). Among other advantages, space sharing contributes to sustainable entrepreneurship (Oswald and Zhao, 2020).

BIs are an umbrella term for various mentoring, networking, and funding programs (Pauwels et al., 2016), and must guide and develop competencies and skills in their incubatees. The role of BI staff in integrating potential tenants with incubation pathways within BIs is significant (Redondo & Camarero, 2017), and BIs should be supported by qualified managers and tailored services to the needs of incubatees (Mas-Verdú et al., 2015).

Valenzuela (2022) points out that universities have a significant role in business incubators, fostering employability, sustainable development, and technology entrepreneurship. Universities contribute significantly with knowledge to improve students' business skills, support students' involvement in practical business activities, development of patent models for innovations, and technology businesses. Kanda and Bank (2015) found that incubators intend to adopt sustainability as an orientation, but guidelines are required to drive them in this pathway (Stein and Winkel, 2021).

This study focuses on identifying and exploring how university-led BIs perceive sustainability in their current operations and future initiatives. The paper will address the drivers and challenges faced by BIs and is organized as follows: Section 2 provides the related theoretical background on sustainability as an orientation for entrepreneurship and innovation, Section 3 explains the qualitative approach adopted for the methodology, Section 4 presents the results, and Section 5 draws some conclusions and implications of the study.

2. Sustainability as orientation

The definition and popularization of the concept of sustainable development led to increasing awareness and importance since 1987 with the Brundtland Report publication. Sustainability is recognized as the only way to meet current human needs without compromising the chance for future generations to enjoy at least the same level of well-being (Brundtland, 1987).

Ensuring sustainable development that benefits current and future generations brings many social and political challenges. This development implies not merely an increase in economic efficiency but an improvement in environmental quality and social justice as well. Such challenges require greater care and preservation of economic, social, and environmental capital (Hunter, 2000; Yan et al., 2018).

In the face of this global reorientation, there is perceived pressure for governments, businesses, and society to redefine their goals toward a more sustainable model. Sustainable development is long-term, durable, consistent, and systematic. As a result, a new development strategy is emerging that encompasses political, economic, social, technological, and environmental dimensions (Leite, 2020).

Furthermore, the Sustainable Development Goals (SDGs) express this consensus which constitutes a political and conceptual advance over the previous agenda defined in the Millennium Development Goals (Cepal, 2016). UN 2030 Agenda for Sustainable Development bases on 17 SDGs, containing 169 targets, which denotes the urgency and importance of this problem at a global level (UN, 2015; Ionescu et al., 2020a). Besides the Global Goals, Environment, Social, and Governance (ESG) concept refers to which extent companies and investors integrate environmental, social, and governance concerns into their business models. It is also used as a criterion to make investing decisions (Gillan et al. 2021).

To achieve Global Goals and address ESG factors, companies need to shift their priorities, from quantifying economic growth at any cost to recognizing and rewarding sustainable economic development. Economic growth and sustainable development are interdependent, but achieving economic performance with an emphasis on sustainability requires a greater share of innovation (Meglio and Di Paola, 2021).

Innovation is crucial for entrepreneurship and, at the same time, determines the capacity of an organization to support its competitive advantages. It helps the organization better answer to rapid and sudden changes within the market and economy (Du et al., 2011). In the past, innovation was considered exclusively equivalent to high technology development and for making products with new features. Nowadays, innovation is considered a continuous and systematic activity that targets the entire organization, including its organizational forms and methods (Ionescu et al., 2020b). Innovation and entrepreneurship are steady vectors to overcoming global societal challenges of climate change and sustainable energy to food and healthy living. Innovation is a facilitator of entrepreneurship. At the same time, entrepreneurship is the answer to innovation. The concepts are undeniably interrelated (Ionescu et al., 2020b).

Companies need to rethink their innovation strategies in an increasingly disruptive business environment. Their long-term success depends on their ability to take risks and explore new areas while leveraging their current capabilities and improving efficiency. To meet this challenge, incubators and companies must foster innovation and growth with an entrepreneurial mindset (Gonthier and Chirita, 2019). Business incubators maximize the adjustment between the services they provide and the specific needs of new businesses, in addition to monitoring their performance, which allows them to detect risks and avoid mistakes (Hausberg and Korreck, 2020). It should be noted that a business incubator center is an effective method for stimulating sustainable economic growth (Olkiewicz et al., 2018). Since it has a positive effect on social, technical, and financial indicators.

3. Data and methods

3.1 Study design

The aim of this paper is to explore how business incubators perceive and integrate sustainability into their operations and initiatives. Multiple-case studies enable exploring this kind of relation (Eisenhardt and Brown, 1998). The focus of this paper is primarily university-linked business incubators managers or adviser's perceptions about sustainability as orientation for BIs. The methodology for investigation process is based on a qualitative research approach of multiple case studies of university-linked business incubators, using semi-structure in-depth interviews and secondary evidences sources (Sithole and Rugimbana, 2014).

Qualitative research using a case study approach is interested in the meaning of experiences to the subjects themselves (Younger, 1985). They require explanatory and argumentative answers from facts that occur over time, not from isolated circumstances (Yin, 1989). According to Baškarada (2014), case study research can be considered a "method for learning about a complex instance, obtained by extensive description and analysis of the instance, taken as a whole and in its context" involving intensive analysis of an individual unit. The case study approach is to provide detailed descriptions and analysis of each individual business incubator, rather than to generalize findings to a larger population.

For this research, a case study was used to accomplish the aim of providing descriptions. In order to prepare an in-depth study, this paper followed Yin (2013) steps through a methodological protocol, as shown in Figure 1.

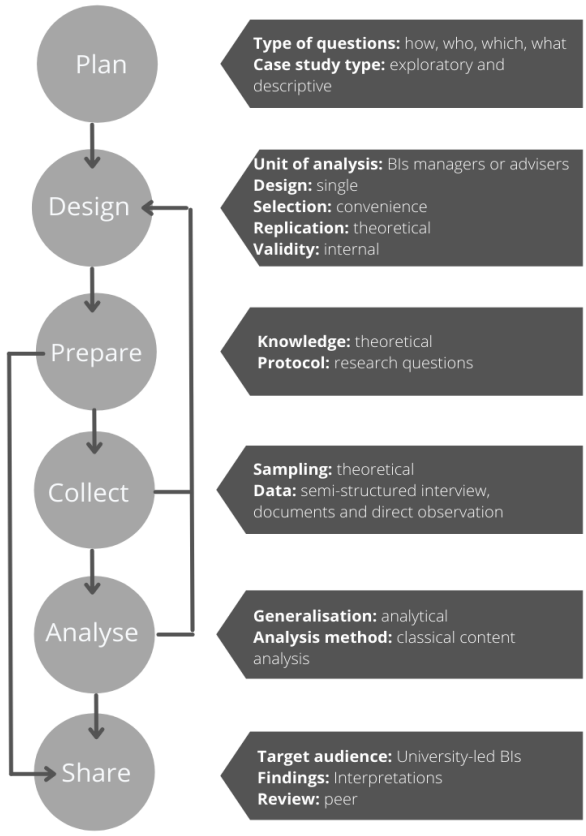

Figure 1 Methodological flowchart
Source: Authors based on Yin (2013).

The data collection instrument was prepared during the planning, designing, and preparing steps. Semi-structured interview protocols in English and Portuguese were developed using a theoretical background from scientific databases about BIs incubation processes and sustainability aspects. It was based on Chais (2019). Business incubation experts checked and validated the instrument.

Three tiers of questions composed this instrument: general information about the BI, incubation process, and incubators and sustainable development. The first two tiers are dedicated to understanding the operation, processes, management, and aspects of the business incubator. The third group of questions was focused on discussing sustainability as an orientation for business incubators.

3.2 Sampling for interview

The multiple-case study approach is considered more convincing, bearing in mind the robustness of the global outcomes (Yin, 2014). The sample was selected through theoretical sampling for convenience (Eisenhardt and Graebner, 2007), which means the invited cases have particular richness concerning the business incubation process. Notwithstanding the ease of accessing these innovation environments and their organizational documents (Martens and Carvalho, 2016). The foremost prerequisite was business incubators managed or associated with universities.

Best-ranked university-led business incubators by UBI Global (2018) and BIs from Inter-University Sustainable Development Research Programme (IUSDRP) were invited to take part

in the study. Eisenhardt (1989) recommends four to ten cases for this type of research. Limited to the availability of the cases were willing to be interviewed. Four case studies were carried out: two incubators from Brazil (University of Passo Fundo Incubator – UPF Incubator and Tecnopuc Startups from PUCRS), one from Portugal (University of Aveiro Incubator – UA Incubator), and one from Germany (HAW Hamburg Start-ups' Service - GründungsService). This study can be considered international despite the aim of not clustering the responses by countries or regions. Figure 2 shows the localization of the interviewed BIs.

Figure 2 Interviewed BIs' localization
Source: My Maps (2021).

To enhance the diversity of our study, we followed the recommendation of Eisenhardt and Graebner (2007) to explore different levels beyond the country-level. Specifically, we considered the maturity level and focus areas of business incubators (BIs), as these can be relevant contingent variables (Carvalho et al., 2016). In the incubation process, BIs' tenants can be either incubatees, representing business ideas in the first stage of development, or start-ups, referring to newly established businesses (Arumugam and Ravindran, 2014).

Additionally, we distinguished between open and closed BIs based on their target audience. Open BIs prioritize diversifying activities, expanding the audience, and attracting new projects, including those not affiliated with the university, while closed BIs focus on tenants who are directly affiliated with the university. According to UNECE (2021), open BIs can cover a

greater audience and have more involvement in the regional business system. For more information on the participants of our study, please see Table 1.

Table 1 Information about interviewed business incubators

Information	Case study A	Case study B	Case study C	Case study D
Name	UPF Incubator	Tecnopuc Startups	UA Incubator	HAW Start-ups' Service
Country	Brazil	Brazil	Portugal	Germany
Affiliation	University of Passo Fundo	Catholic Pontifical University of Rio Grande do Sul	University of Aveiro	Hamburg University of Applied Science
Acronym	UPF	PUCRS	UA	HAW Hamburg
Opening	2015	2003	1996	2007
Focus-areas	Computer science and information technology	Technology and impact business	Information and Communications Technology (ICT), energy, sea, materials, and agro-industry	None
Staff	Three (Executive and advisors)	Six (Manager and advisors)	Three (Director and advisors)	Three (Director and advisors)
Number of tenants	9 incubees	80 start-ups	35 incubees 9 start-ups	3 incubees
Target audience	Open BI	Open BI	Closed BI	Closed BI
Innovation ecosystem	Conecta UPF	Tecnopuc and Alliance for Innovation	PCI – Creative Science Park Aveiro Region	beyourpilot

3.3 Data collection

Data collection incorporated multiple qualitative data sources, including thematic interviews, observation, official documents, videos, images, and general information about the research objects. Data collection was from March 2020 to August 2020. For participation acceptance in the qualitative research, the interviewees received the interview protocol and a consent form in advance. Four individual in-depth interviews were performed with incubator managers and advisers. The interviews were previously scheduled, and the virtual meetings lasted between 40 and 70 minutes. The interviews were recorded and transcribed for further analysis. Some interviewees shared documents from the BIs. Supplementary information was collected from the official BIs' homepages. The interviewer carried out direct observation during the meeting, taking notes of the most relevant considerations and aspects. Secondary sources were used to complement the data collection. All the documents written in Portuguese or German were translated into English in order to enable and standardize the content analysis.

3.4 Data analysis

Considering all sources of information, the analytical approach was performed by classical content analysis (Yin, 2005). It is considered an efficacious research tool to organize and elicit meaning from qualitative data collected, determine the presence of upwards of concepts and relationships, and draw realistic conclusions from it (Bardin, 1995; Bazeley, 2013; Bengtsson,

2016). Content analysis was brought off using ATLAS.ti software, a qualitative data analysis software able to organize, systematize, and sort raw data (Bazeley, 2013; Sithole and Rugimbana, 2014). Bergtsson (2016), Bardin (2011), and Minayo (2017) highlight content analysis should follow rigorous and chronological steps, such as pre-analysis (decontextualisation), exploration of the material (recontextualisation and categorization), and compilation (interpretation of results).

A query was carried out with the coded documents of each case through frequency of words. All terms from the gathered documents were used to create the word cloud. Some irrelevant terms for the analysis were removed, for instance: more, very, many, one, little, much, even.

Sithole and Rugimbana (2014) proposed a data analysis approach by "within-case analysis" and "cross-case analysis." In order to develop a rich familiarity with each case, within-case analysis is performed, detailing case-study write-ups for each site (Eisenhardt, 1989). After that, a look at the data in divergent ways, identifying tendencies (Eisenhardt, 1989).

3.5 Rigour

The research quality is related to the rigour of the methodological application, as well as the treatment of data. Bengtsson (2016) argues the credibility groundwork initiates when the planning of the study begins and should follow through all phases of the methodology. In order to confer to the research, Guba and Lincoln (1989) recommend the observation of four criteria: credibility, transferability, reliability, and confirmability. Techniques were performed to address these criteria. Data triangulation, codification, and systematization were performed, considering different sources of information for each research unit. Using multiple data sources enhances the validity of the research (Eisenhardt, 1989)..

4. Results and discussions

4.1 Within-case analysis

Case study A: UPF Incubator

Case A is a Brazilian incubator managed by the University of Passo Fundo Foundation. This innovation environment aims to stimulate innovative and technology-based entrepreneurship in the university's coverage region. Figure 3 represents the most relevant words from Case A.

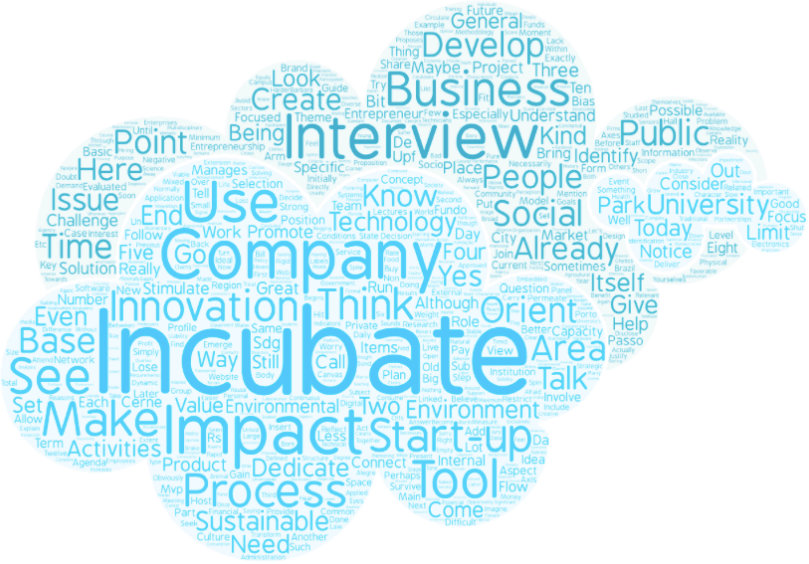

Fig. 3 UPF Incubator's word cloud

The concept of sustainability and impact entrepreneurship is frequently mentioned in the incubator's statements, indicating awareness of these issues.

> […] we need to turn on a warning signal in the heads of managers of **innovation environments** for the identification of **impact companies** […] to stimulate **people** to look at these issues and not stay waiting as a passive agent […] to have more dynamic **environments** that promote **innovation** […] it would be a big and significant step for us to create favorable **environments** for the emergence of these **social impact** businesses […]

UPF Incubator emerged linked to the university's Scientific and Technological Park. It has gotten closer to the regional innovation ecosystem. Developing an innovation culture in the region is one of the main aim of empowering this ecosystem. The manager reports challenges as innovation culture and sources of investment in the BI region.

Recently, this BI have looked for impact ideas. However, there is no selection method to identify impact businesses. The incubation process does not have activities dedicated to sustainability orientation. The manager believes the use of the sustainability-oriented archetype is not relevant. The following quotes reveals this concerning.

> […] to what extent this identification is relevant, even because we are talking about companies that are capable of changing very quickly […] promoting sustainable development is much more than simply dedicating the incubator to impact enterprises […] I am afraid this concept will be misunderstood, so we prefer to carry on and observe this movement and see how we will insert this […]

This perception is in line with some studies that reveal a sustainability-oriented business incubator (SOBI) is not required to focus wholly on environmental and social issues (Stein and Winkel, 2021). Sustainability may be more than a legitimating strategy for business incubators (Klofsten et al., 2020), which should mix sustainability-oriented start-ups and ideas with conventional business, resulting in a broad selection base (Bank and Kanda, 2016). A broad operation approach and a non-specific sector are essential factor of success for SOBIs (Bank et al., 2017). One of the most relevant challenge that sustainability-oriented business incubator perceive is insufficient green start-ups' applications, forcing some of them to revise their goals or close their activities (Klofsten et al., 2016).

Case study B: Tecnopuc Startups

The Brazilian innovation environment Tecnopuc Startups is a new business model proposed by the former business incubator Raiar. It aims to stimulate and operationalize the entrepreneurial vision at the university through the development of technology-based businesses that generate some impact on society (economic, social, or environmental). The word cloud diagram (Figure 4) shows the frequency of words for this case.

Figure 4 Tecnopuc Startups' word cloud

Tecnopuc Startups is focused on developing an innovation ecosystem for their start-ups. Some quotes highlight this strategic position adopted.

> […] based on what we see in some innovation **ecosystems**, where they choose to work the whole **ecosystem** […] changing from incubation to an **ecosystem** model […] instead of working **business** by **business** with the **entrepreneur**, we started to create an **ecosystem** where the **entrepreneur** offers items that make sense for the **start-up** […] we began to welcome **impact businesses** that do not necessarily have technology in their **business** […] for the **ecosystem**, it brings an absurd logic […] **impact businesses** automatically **impacts** the space in which it is inserted [...] directly affects the **ecosystem** in a positive way […] our concern is to **impact** our **ecosystem** positively and, consequently, society as a whole […]

Tecnopuc Startups considered a model transition necessary in order to scale the business fostering model. In addition to creating a movement to strengthen the internal ecosystem of the start-ups, Tecnopuc Startups have operated the Alliance for Innovation with the largest regional universities, sharing assets and promoting the interaction of the teams. Players realized that the understanding of sustainability-oriented innovation and entrepreneurship was still incipient. Then they began to understand these concepts better.

Tecnopuc Startups has some cases of impact business, such as GreenTechs and SocialTechs. However, it hasn't offered specific assets to develop and operate directly sustainable entrepreneurship. Only awareness initiatives have been carried out. The following quotes corroborates with these notes. Raising awareness is fundamental for developing start-ups (Hackett and Dilts, 2004), and it is not different for sustainability-oriented ones (Bank et al., 2017; Kanda and Bank, 2015; Fonseca and Jabbour, 2012). The interviewer highlights the fact that the majority of businesses generate social and environmental impact. However, they are not attentive about it. This innovation environment encourages entrepreneurs to reflect on business value propositions regarding sustainability impacts and the SDGs (UN, 2016) they are bringing, what problem the start-up, project, or idea is solving or addressing.

Case study C: UA Incubator

UA Incubator is an innovation environment in the Portuguese region of Aveiro, geared towards high-potential industries, a driver for the creation of the university and the business incubator. UA Incubator aims to be a space to host, stimulate, and support the incubation of innovative ideas and start-ups, mostly of technological nature and with high growth potential. Figure 5 reveals the most frequent words for the UA Incubator case study.

Figure 5 UA Incubator's word cloud

UA Incubator has taken part in a regional initiative of the quadruple helix (Carayannis and Campbell, 2010). The BI takes part of a multiplayer project to promote innovation, knowledge, and entrepreneurship, contributing to strengthening competitiveness, the establishment of qualified human resources, production, and scientific, technological, educational, and cultural research in the region, the PCI Creative Science Park (PCI, 2022). The interviewer cites some situations that come up with this affirmation.

> […] it is a towering **project** for the whole **region** […] aligned with the **regional** objectives […] the goal is to work as a network, to stimulate entrepreneurship in the entire **region** […] it is in the name of the **university**, **industry**, two banks and all that are business associations […]

This business incubator is focused on priority areas and welcomes ideas and start-ups for three stages of incubation: Start, Start Up, and Start Go. Any project or start-up can applicate for incubation stages. There is a pre-screening to check if the applicant fits into UA Incubator's aims. They have a significant demand for tenancy and a monthly routine for new projects or ventures selection. The Portuguese government fosters innovation from international projects, and UA Incubator has hosted many of them. This BI uses metrics to monitor projects and assess if start-ups are moving forward. Notwithstanding, they self-evaluate the offered incubation programs.

UA Incubator's initiatives and incentives address sustainability and the UN Agenda 2030. Their entrepreneurs are concerned with the aspect of projects' sustainable impacts. The interviewee reveals these perceptions in the following sentences.

> […]it has to do with the 2030 Agenda Goals, all incentives are feared to this […] currently, all initiatives in Europe have specific clauses to rate the project […]

Siqueira et al. (2022) mention that both the SDGs and Environmental, Social, and Governance (ESG) principles seek to achieve the ideal of a sustainable society, solving social, environmental, and economic challenges. Increasingly ESG aspects have become prerequisites for funds and incentives, not only governmental ones but private ones (Puzzonia, 2018; Xue et al., 2019; Ionescu et al., 2020; Zhang, 2021). Puzzonia (2018) considers ESG the most relevant aspect of differentiation for investments and guidance for the policies of large financial funds. Siqueira et al. (2022) mention that both the ESG and the SDGs seek to achieve the ideal of a sustainable society, solving social, environmental, and economic challenges. Responsible investments in sustainable innovations and organizations have intensified as the post-Covid scenario requires a sustainable and resilient recovery.

Case study D: Gründungservice HAW Hamburg

Gründungservice HAW Hamburg has supported innovative ideas since 2007, aiming to develop projects into a business through one-on-one consulting and mentoring, and group exchanges. Figure 6 presents the word cloud using words from the BI’s gathered documents.

Figure 6 *Gründungservice* HAW Hamburg’s word cloud

The *Gründungservice*, a German term for “start-up service”, has taken part in a metropolitan innovation ecosystem, the Beyourpilot project. It is a platform proposed by the city hall of Hamburg with other institutions, such as Technische Universität Hamburg, Universität Hamburg, and Deutsches Elektronen-Synchrotron. HAW Hamburg Incubator takes part in another important initiative – Innovation Contact Point - focused on connecting small and medium businesses with scientific institutions in order to research and develop new products and services.

HAW Hamburg is a public university. Then, the incubation process is free of charge. HAW Hamburg Incubator offers a pre-incubation program and supports students' innovative ideas. Students, lecturers, or academic staff contact the BI looking for support and funds opportunities. If they get funded, they can stay for one year occupying a physical space. However, as soon as an idea becomes a formal company, they are not allowed to use the incubator infrastructure.

This BI aims to develop sustainable solutions for present and future social challenges. Currently, they provide workshops about sustainability during summer school. Some quotes from the incubator manager reveal this fact. The manager also reports metropolitan region of Hamburg has several green start-ups, and the majority of entrepreneurs are women. She believes this fact could motivate female students to invest in sustainable entrepreneurship.

4.2 Cross-case comparison

Data analysis from all sources of evidence revealed key themes (codes) surrounding sustainability as an orientation for business incubators. These codes are presented in the following sections.

Sustainability-oriented Business Incubator (SOBI)

Interviewees reported a range of views and beliefs regarding sustainability-oriented business incubators.

> […] there have been quite a few resource-saving and impact-oriented incubators emerging […] to promote businesses that intend to generate social or environmental impacts, without losing their innovative character, without losing the entrepreneurial aspects […] socio-environmental purpose […] within its value proposition […]

Sansone et al. (2020) and Villares et al. (2020) argue BIs can be a vital way to achieve SDGs, indirectly supporting their targets, including Global Goals among their specific objectives. SDGs are the fundamental pillars of the new generation of BIs (Surana et al., 2020). Some affirmations could be highlighted from the interviews.

> […] it has to cover at least some of the sustainability goals […] we ask the entrepreneurs, what is the SDG they are bringing, what is it solving, what is the problem the start-up/project/idea is addressing […] now we have all projects somewhat focused on this strand in consideration of these goals […] each idea that comes up has to cover at least some of the sustainability goals […]

The investigation of the four cases allows an understanding of the main factors of the SOBI approach and the connections between them. Figure 7 presents the network developed from the study cases' documents and interviews.

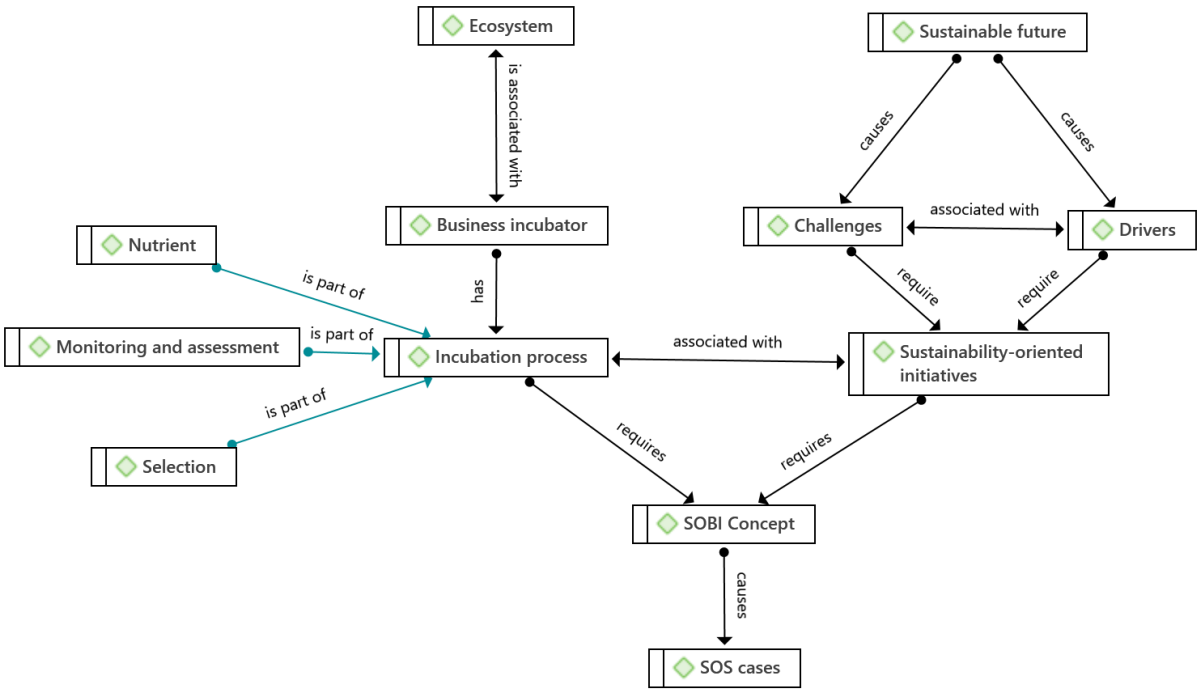

Figure 7 Framework of SOBIs' approach

A business incubator must be part of an innovation ecosystem. BIs incubation process is provided by nutrients (assets and support facilities), mentorship, assessment and selection process. Sustainable future brews challenges and opportunities that encourage innovative sustainability-oriented initiatives. These initiatives, together with incubation process, embody an incubation concept guided by sustainability, basing cases of sustainable start-ups and positive impact for the innovation ecosystem. A fourth generation of BI came up (Figure 8). A SOBI has the value proposition of being part of an ecosystem that strengthens and promotes positive social and environmental impacts while observing leading aspects of business financial sustainability.

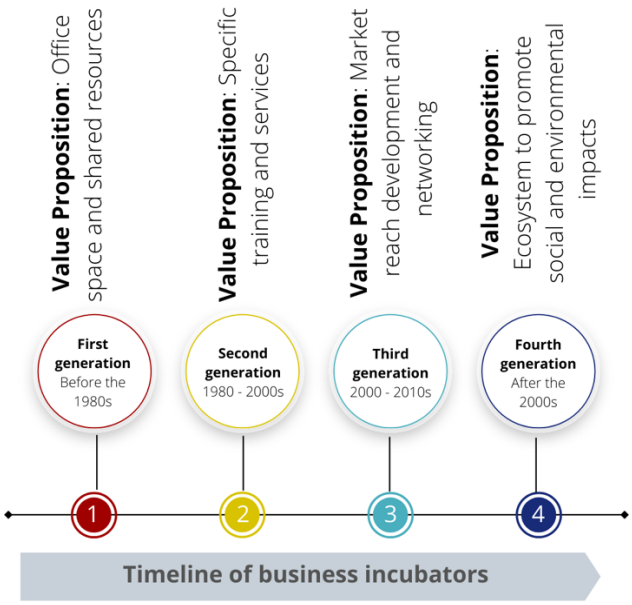

Figure 8 Framework of SOBIs' approach
Source: Authors based on Bruneel et al. (2012) and UNECE (2021).

Sustainability-oriented initiatives

Activities with a strong appeal for sustainability appear clearly in the interviewees' discourses. However, some incubators recognize that sustainability-oriented initiatives were often parallel, disconnected, and unstructured, and not integrated into the overall program. Table 2 presents the main quotes supporting these observations.

Table 2 Statements of the interviewees related to sustainability-oriented initiatives

Case study	**Citations**	**Incubation process' area (Machado et al., 2018; World Bank, 2010; Fichter and Hurrelmann, 2021)**
A	[…] the call for proposals already includes this companies profile […]	Tenants' promotion and selection
	[…] this theme permeates our speech, concern, nod to companies […]	People connectivity
	[…] we provoke the entrepreneur to really understand the possibilities of what they are proposing to do […]	Business service
B	[…] we had a Social Garage […] a pre-incubation program for impact incubators […]	People connectivity
	[…] we indicate start-ups to calls for impact business […]	Financing
	[…] we have some sensitizing attitudes […]	Business service
C	[…] we have oriented our entrepreneurs toward savings […]	Infrastructure
	[…] sessions for the unemployed population […] hackathon […]	People connecting
D	[…] try to get students to the idea of sustainability […]	Business service
	[…] workshop about sustainability […]	People connecting

The performance of a SOBI depends on the overall design of the incubation process and offered supporting services (Bank et al., 2017; Fichter and Hurrelmann, 2021). An interviewee mentioned, "business incubators have to provide essential nutrients to the fairly new business". In line with the services and assets Fichter and Hurrelmann (2021) and UNICE (2021) propose for SOBIs' incubation process, the interviewees mentioned as nutrients: workshops, co-working, research, networking, connecting, laboratories, mentorship, project, and founding.

SOBI challenges and drivers

The investigated business incubations presented challenges and drivers for sustainability-oriented business incubators and sustainable start-ups (Figure 9).

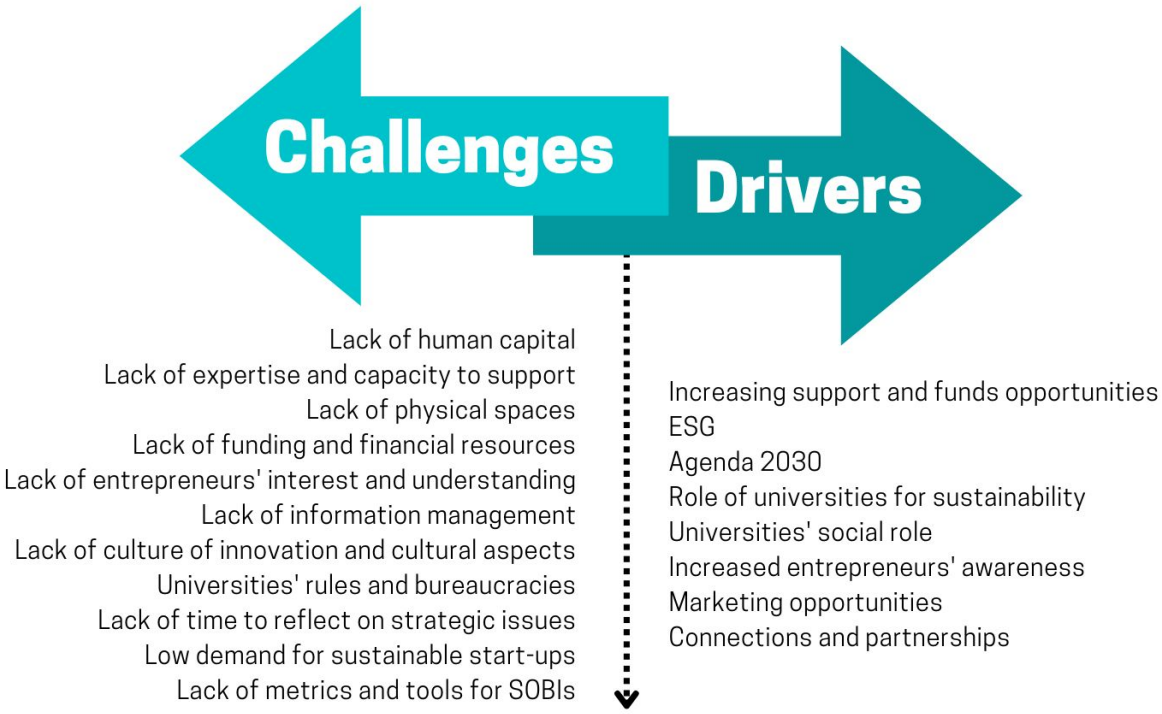

Figure 9 SOBI challenges and drivers

The cited challenges faced by BIs are the same for other incubators (Lose and Tengeh, 2015; Tengeh and Choto, 2015; Mahmood et al., 2017), such as lack of human capital and reduced staff to support business. They argue their current professional staff is disable to stand the increasing number of tenants. BI staff is focused on operational activities and solving administrative due to universities bureaucracies, causing a lack of motivation. Incubators human resources are crucial to support nascent businesses (Scaramuzzi, 2002; Fukugawa, 2018).

The BIs present lack of expertise and capacity for supporting sustainable businesses. Qualified and experienced staff is critical element to the BIs (Cullen et al., 2014). Then, focusing only on sustainability-oriented business may be a threat. Entrepreneurs often struggle to prioritize sustainability issues (Sendawula et al., 2021). According to the interviewees, entrepreneurs lack interest in or understanding sustainability. Entrepreneurs' expertise is a challenge to promoting sustainable business (Buys and Mbewana, 2007; Cullen et al., 2014). Interviewees pinpointed entrepreneurs often confuse sustainable entrepreneurship with welfare business. They are not aware their businesses generate social and environmental impacts.

Financial resources and funds are critical challenges for incubators and start-ups (Scaramuzzi, 2002; Lose and Tengeh, 2015; UNECE, 2021). For businesses aligned with sustainable development, funding and sponsorship are relevant opportunities. Increasingly, innovation projects must show at least intrinsic concern about sustainability issues. The UN Agenda 2030 and ESG funding are estimated to open up more than 12 billion dollars annually in market opportunities (SDC, 2017). Sustainability can improve a business's image and market position (Cullen et al., 2014), a driver mentioned by the interviewees.

The fact of being university-based boosts the sustainability approach, whereas higher education has an important role in sustainable development implementation (Leal Filho et al., 2017). One of the interviewees believes this is the new generation of universities, bringing something good back to society.

Innovation ecosystem

Being part of an innovation ecosystem was the main future position mentioned by the interviewees, allowing the development of networking. Innovation ecosystems consist of a dynamic and interactive network gathering actors to enable, develop and co-create knowledge and innovation by multi-layer relationships (Jackson, 2011). They are attracting increasing attention from innovation agents to exchange knowledge and information (Xu et al., 2020).

Universities are nests of knowledge transferring to companies and industries by projects and new business, generating innovation (Xu et al., 2020). BIs act as a bridge into an innovation hub (Hackett and Dilts, 2004; UNICE, 2021). Within and across the boundaries of their associated universities, the investigated BIs have taken part of different projects, ecosystems, or hubs.

5. Conclusions

This study aimed to analyse how BIs perceives sustainability in their current operations and future initiatives. The results show that sustainability-oriented business incubators are still incipient, even though they reflect a relevant approach. There is a strong appeal for sustainability in the discourses, but some incubators recognize that their actions on sustainability are parallel, disconnected, and unstructured, not part of the whole program.

This scenario could be explained by the challenges identified, which refer to structural issues (human capital, physical spaces, and financial resources), cultural issues (start-up interest and understanding, innovation culture), strategic issues (lack of time to reflect the business strategy, low demand of sustainable start-ups) and issues related to university context (rules and bureaucracies).

On the other hand, exploring the ESG funds and Agenda 2030 is a paramount driver. The SDGs and ESG factors are the basic pillars of the sustainability approach and offer funding opportunities. ESG approach provides market differentiation and a better image for start-ups. In this sense, entrepreneurs have increased awareness about businesses' positive impacts on the society and environment. In addition to the drivers, universities have developed expertise regarding sustainability issues and have a crucial role in sustainable development achievement.

The new archetype of business incubators, oriented toward sustainability, has enormous potential for universities and can be a fish to fry. However, BIs have to shed light on the challenges of not becoming a white elephant. One way to overcome these challenges and take advantage of these drivers, BIs should consider rethinking their incubation models and leveraging innovation ecosystems to enhance the support and knowledge-sharing they provide.

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8. ARTIGO 05

Reshaping BIs in universities: looking for a theoretical framework and guidelines for sustainability-oriented business incubators

Abstract: Worldwide, a new archetypal business incubator (BI) has emerged: the sustainability-oriented business incubator (SOBI). Universities can be the nest of sustainable innovations and ventures, consolidating their role in promoting sustainability. Increasingly, scientific interest in this topic is coming up. However, a theoretical model to led universities and guidelines for establishing a university-based SOBI were not found. This study overcomes this literature gap based on qualitative research from multiple case studies through structured in-depth interviews carried out with business incubators' delegates. The aim was to identify general principles about sustainability orientation and business incubation. After a content analysis, a theoretical model and guidelines for developing SOBIs associated with universities were developed and validated with a university-led BI. This study is limited to university-based BIs, the ones associated with or managed by a university.

Keywords: Business incubator – University-led – Theoretical model – Sustainability-profiled – Guidelines.

Highlights:

- Education for sustainability, people connectivity, and human resources are crucial factors for SOBIs.
- University-linked SOBIs can benefit from the educational system.
- SOBIs and traditional BIs are distinguished by stimulating the development of sustainability competences.

1. Introduction and motivation

Increasingly, awareness about sustainable development is emerging, as well as funding, entrepreneurship, and innovation based on sustainability (Bank, 2020). Environmental, Social, and Governance (ESG) funds and the UN 2030 Agenda for Sustainable Development recognized science, technology, and innovation as indispensable drivers for sustainability and the Sustainable Development Goals implementation (UN, 2016). Sustainable innovation can provide ventures with valuable, unique, and novel resources and capabilities to develop new competitive advantages (Hart and Sharma, 2004).

Like never before, innovation and sustainability have been critical for the long-term inclusive, sustainable, and resilient recovery of economies and societies worldwide (UNECE, 2021; Ávila et al., 2019; Shulla, 2021; UN, 2023). As innovation and new venture hatcheries, business incubators have been able to advise, support, promote, and provide a nurturing environment for new business start-ups and entrepreneurs (Gerdsri et al., 2021). Over and above that, BIs can be promoters of sustainability thinking (Fonseca and Jabbour, 2012; Brito et al., 2014;

Hernández and Carrà, 2016; Bank, 2020), specifically the university-based ones (Lin-Lian et al., 2021).

Bank (2020) argue the support given to tenants in green incubators has not been different from conventional ones, suggesting they have to change their mindset and strive for sustainable entrepreneurs' buildout. Nevertheless, Lose et al. (2020) pointed out that, in particular, faced with a new scenario caused by the coronavirus pandemic, business incubators need to remodel their incubation deliverables, incubation processes, and conceptual models to promote the survival of their start-ups and aggregate value to their businesses. Therefore, a question has been asked repeatedly by university-led BIs' managers and staff concerned about the sustainable future of society: how can business incubators orient to sustainability and enhance their assets, support activities, and programs to generate positive impacts on society and the environment?

Theoretical models for business incubators are known widely in the scientific scenario. Despite the popularity of BIs in the literature and practice, few studies focus on social and environmental impact incubators or, more specifically, models or guidelines for sustainability-oriented business incubators based on universities.

Since the beginning of the 2010s, sustainability as an orientation for business incubators has emerged in the academic field (Fonseca and Jabbour, 2012). Some studies have pointed out factors reflect the demand for answers to this question (Kanda and Bank, 2015; Hernández and Carrà, 2016; Bank et al.; 2017; Brito et al., 2018; Klofsten et al., 2020; Klofsten and Bienkowska, 2021; Gerdsri et al., 2021). Studies have shown the sustainability-profiled BIs' impacts on innovation and entrepreneurship ecosystems (Lamine et al., 2018; Olkiewicz et al., 2018).

Recently, Bank (2020) worked on a Ph.D. dissertation exploring the attraction, selection, and support of sustainability-oriented business incubators as significant players in reorienting start-up businesses towards sustainability. Stein and Winkel (2021) worked on a master's thesis in Business Administration, providing insights into the importance of different support systems from the sustainability-oriented incubators. Fichter and Hurrelmann (2021) published a handbook chapter discussing sustainability-oriented business incubation, identifying start points and essential factors for effectively integrating sustainability into the impact assessment of their programs, providing tools and methods for sustainable business model development, and pinpointing knowledge gaps about SOBIs. UNECE (2021) published a handbook to guide policymakers from the seven SPECA countries (Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) to set up, run, and evaluate business incubators to achieve sustainable development in line with the UN 2030 Agenda.

Despite the existing research, the limited understanding of sustainability-oriented business incubators pinpoints a clear gap in scientific knowledge (Bank et al., 2017; Apostolopoulos et al., 2018). Moreover, few studies address sustainability and university-led BIs (Hassan, 2020; Brito et al., 2018). Given the significant need to fill the gap in the literature and to improve the

knowledge of university-based SOBIs with a focus on a model reshaping, the interest of this study lies in developing a framework/model and guidelines to lead the way university incubators slotting sustainability as an orientation toward their incubation programs, assets, and support initiatives. In this sense, this research confers an innovative character, contributing to improving sustainable development and Global Goals knowledge, a topic of extreme relevance that will guide worldwide strategies until 2030 (UN, 2016). The results can better channel university business incubators to focus on reorienting their programs towards sustainability, as well as guide managers and staff, step-by-step, through the setting up and running of business incubators to catalyse sustainable development.

2. Background literature on university-led business incubators and sustainability orientation

The first BI was established in 1959 by Joseph Mancuso in New York, United States of America. Riding this wave, the United Kingdom (UK) and other Western European countries established BIs in varying forms, such as science parks, innovation centres, and technology parks (Hassan, 2020). Previous studies on the intensity of assistance to firms and continuous mentoring by incubators have shown a positive impact on producing performance and profitable BIs (Khalid et al., 2017). With the advancement of technologies, BIs have been included as a contributor to policy needs for social and economic development, reducing unemployment, helping new venture creation, and business goals achievement (Jamil et al., 2016; Sanyal and Hisam, 2018). BIs also develop entrepreneurial clusters and improve networks and linkages between universities, the business community, and the government (Sanyal and Hisam, 2018).

Over the years, universities perceived, besides their role as a source of knowledge, community engagement and entrepreneurial collaboration were crucial to creating value for the educational ecosystem (Rubin et al., 2015; Redondo and Camarero, 2017). From then on, the inclusion of innovation and entrepreneurship has become a prominent objective in most universities worldwide (Yasin et al., 2021). With the popularity of innovation centres, university-led business incubators emerged to convert academic research into commercialization and support technology transfer, transforming knowledge into innovation (Rubin et al., 2015; Kolympiris and Klein, 2017). University-linked BIs can provide the first contact of academics with entrepreneurship (Kolympiris and Klein, 2017), providing pre-entrepreneurial support to future entrepreneurial students and graduates (Redondo and Camarero, 2017).

It is worth noting BIs seek beyond physical and economic infrastructure, also providing intellectual capital, structural capital, human capital, and relational capital (Indiran et al., 2017). Structural capital comprises the form a BI operates by its specialisation, entry policies, and ranking of the incubation pathway. Human and intellectual capital refers to coaching and training in the development of new start-ups or new companies. Relational capital touches on the networks received internally and externally among incubates (Redondo and Camarero, 2018; Bennett et al., 2017). These capitals arguably meet the needs of new entrepreneurs, having tangible and intangible components to support new ventures.

Rubin et al. (2015) pinpointed the most valuable enabling factors for university incubators are human and intellectual capital, followed by financial, organizational, and technological resources. Interaction between students, academic staff, incubatees, graduated start-ups, and incubator is essential in transferring technology and market knowledge. In parallel, this interaction is instrumental in promoting entrepreneurial learning and culture within BIs and can be related to an entrepreneurial ecosystem for students. The ecosystem is multifaceted and includes BIs as one of the components in addition to entrepreneurship courses, grants, and accelerator programmes (Wright et al., 2017). Indeed, university-linked BIs are a component in the entrepreneurial and educational ecosystems in inducing entrepreneurial orientation and nurturing students through professional or training programmes.

University-linked BIs envisage the creation of new knowledge and innovation in collaboration with other stakeholders, such as government organisations, consultants, research centres and universities, customers, society, and non-governmental organizations or other private companies considered as triple, quadruple, and quintuple helix cooperation (Carayannis et al., 2021; Uvarova et al., 2021). It foresees the interaction of academia, the private sector, government, and society in a surrounding environment, promoting sustainability organically and cyclically through innovation (Carayannis and Campbell, 2010).

In recent years, the inclusion of principles of the quintuple helix, Sustainable Development Goals (SDGs), and Environment, Social, and Governance (ESG) has become an objective in most innovation environments (Yasin et al., 2021). Sustainability-oriented Business Incubators (SOBIs) are innovation environments that implement sustainability thinking in the start-up community and hence play a significant role in reorienting ventures toward sustainability (Bank et al., 2017). It is the fourth generation of business incubators, following up on the timeline proposed by Bruneel et al. (2012) and UNECE (2021). Its value proposition is the insertion of business incubators within an ecosystem that strengthens and promotes social and environmental impacts while observing pivotal aspects of business financial sustainability. Considering the fact universities' educational ecosystem assets, university-linked BIs have the potential to guide their activities toward sustainability and explore this innovation and market trend (Redondo and Camarero, 2017).

3. Material and methods

3.1 Study design

This paper is an exploratory study aiming to provide a theoretical framework and guidelines to reshape the university-based business incubator model toward sustainability. Eisenhardt (1989) advocates multiple data collection sources to support research validity. In this sense, the research method is a mixed and two-fold study: a quantitative approach using an online questionnaire to derive rich information about the incubators and multiple-case studies qualitative approach to determine the incubation patterns and models in universities.

The quantitative stage used an English-written survey as a data collection instrument, comprising 27 items divided into two parts to investigate BIs general information, incubation processes, and sustainability orientation. The questionnaire was pre-tested by a panel of university-led business incubators. Hair Jr. et al. (2019) consider quantitative methods using surveys adequate to obtain answers from a sample and using an online tool for data collection to democratize the participation of a wide number of participants (Raju and Harinarayana, 2016). Google Forms was the online platform used for the survey considering it is free of charge and the most accessible and popular tool (Raju and Harinarayana, 2016).

Based on a multiple-case studies approach, the qualitative method used literature sources and semi-structured in-depth interviews with related parties. Qualitative research is a holistic method that combines data analysis with related aspects (Saptono et al., 2020). It explores the meaning of experiences and learning from complex contexts through intensive analysis of an individual unit (Younger, 1985; Yin, 1989; Baškarada, 2013). The method followed the steps proposed by Yin (2013): planning, design, preparation, collection, analysis, and sharing. The case study type is exploratory and descriptive. The unit of analysis was university-linked business incubators (BIs). The data collection instrument was English and Portuguese-written semi-structured interview protocols prepared based on theoretical background about sustainability and business incubation and validated by experts. The protocol was composed of three categories of questions addressing general information, incubation process, and sustainability-oriented BIs.

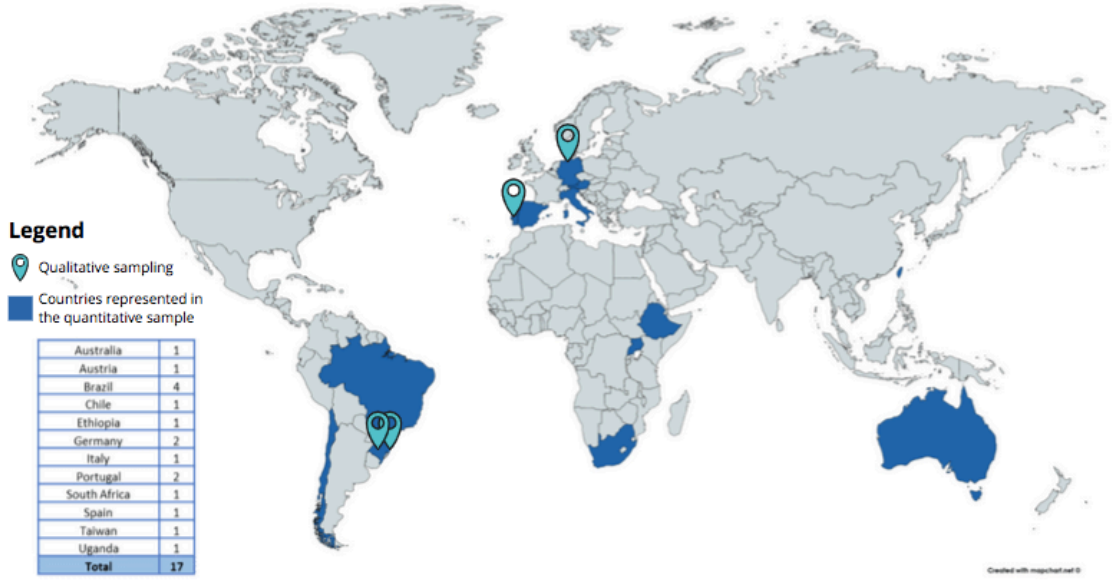
The empirical findings were matched to the literature to strengthen the proposed model at a higher conceptual level describing a broad phenomenon (Voss et al., 2002). After that, Adamy et al. (2018) indicate “sit in a circle” for the model validation due to dialogical and dynamic character. This technique provides an opportunity for reflection and ideas consolidation. Sharing and developing knowledge represent the studied phenomenon. Stakeholders from a Brazilian university-led were invited to analyse and give feedback about the proposed model and guidelines.

3.2 Sampling for interview

Nonetheless, the aim is not to cluster the responses by countries or continents. The prerequisite for the survey and case study samplings was BIs based on or led by universities. Barbero et al. (2012) and UBI (2018) define university-led BIs as organisations that provide support for new ventures and derive their objectives primarily from one or more universities. In this sense, convenience sampling, easier to contact and reach (Given, 2008), was the adopted approach in order to select incubators with the know-how and information-rich (Palinkas et al. 2015).

For the online survey, invitation e-mails were sent to BIs from the UBI Global Ranking list (2017/2018), from the list of members of the Inter-University Sustainable Development Research Programme, and participants of the World Incubation Summit 2018. Following this, a snowball approach was adopted (Goodman, 1961). In total, a set of 17 incubators from 12

countries took part in the study. Regarding the qualitative methodological stage, BIs participants of the first stage of the study were invited. Four BIs agreeded to take part in the interviews, and all of them were deemed suitable for the study. The limitation of the sampling was the willingness of the BIs managers, advisers, and staff to be interviewed or answer the questionnaire. Figure 1 shows the countries the BIs participants are from.



Australia	1
Austria	1
Brazil	4
Chile	1
Ethiopia	1
Germany	2
Italy	1
Portugal	2
South Africa	1
Spain	1
Taiwan	1
Uganda	1
Total	**17**

Figure 1 Localization of BIs participants of the study
Source: Authors (2022)

Eisenhardt and Graebner (2007) and Carvalho et al. (2015) argue to explore different locations and focus areas. Regarding the participants from the online survey, the most cited areas were Information and Communication Technologies (ICT), biotechnology, 4.0 industry, climate and environment, food, and agribusiness. For the qualitative study, Brazilian business incubators (n=2) are focused on technology and impact business, ventures oriented to promote social and environmental positive outcomes and impacts. Portuguese BI adopts as focus-area vocations of the region, such as ICT, energy, sea, materials, and agro-industry. On the other hand, German BI has no focus on accepting new ventures or entrepreneurial projects from different focal points.

3.3 Data collection

For the quantitative stage, the data collection instrument was an online survey carried out from October 2019 to January 2020. Considering the snowball approach, it is difficult to calculate the response rate of the total target population of incubators. The study was not interested in statistical representativeness but in identifying features regarding the research question. Therefore, the sample well represents relevant patterns combination (Kelle and Kluge, 2010).

On the other hand, the data collection method for the qualitative approach included multiple sources of qualitative data, including thematic interviews, observation, official documents, and secondary sources such as articles, books, journals, and other sources about the research objects,

as proposed by Saptono et al. (2020). From March 2020 to August 2020, four interviews were performed with BIs managers or staff. Due Covid-19 pandemic, the interviews were carried out through virtual meetings lasting between 40 and 70 minutes. The interviewer recorded the meeting with the consent of the participants, as well as the interviewer took notes of the most relevant aspects. The recorded speeches were transcribed and translated into English to standardize the document study, extracting, organizing, reading, and evaluating research literature (Togia and Malliari, 2017).

Moshood et al. (2022) suggest using aggregators and publishing databases to extract sources and reliable publications to match the approach and complement the study findings. Scopus, Taylor & Francis, Springer, Emerald Insight, Multidisciplinary Digital Publishing Institute (MDPI), Science Direct, and Google Scholar were used to collect relevant English-written content in the literature about sustainability orientation challenges and drivers, business incubation, and sustainable business model innovation.

3.4 Data analysis

Simple descriptive statistics were used to summarize the information about incubators from the quantitative sample. For the qualitative stage, Bardin (1995) and Bengtsson (2016) recognize content analysis as a useful tool to organize and elicit meaning from qualitative data to draw conclusions and relationships. Thus, classical content analysis was used to perform an analytical approach (Yin, 2005). The software ATLAS.ti was used to organize, systematize, code, and sort raw data (Bazeley, 2013).

To produce analytical conclusions, this study used triangulation and discussion techniques (Guba and Lincoln, 1989, Nunes et al., 2022), considering different sources of information. The main features were considered to develop the guidelines and model of SOBI in universities.

3.5 Rigour

This study carried out a model validation to ensure the research rigour. Validating means checking the consistency of a model and reviewing and discussing possible changes to the concepts and constructs contained in the theoretical model (Souza Filho and Struchiner, 2021). It carries different views on the possibilities of modifications, additions, exclusions, or revisions of the proposed structure (Westmoreland et al., 2000).

The technique of "sit in a circle" (Adamy et al., 2018) was dynamic by stakeholders from a Brazilian university-led BI (Corbin and Strauss, 2015; Souza Filho and Struchiner, 2021). Firstly, a meeting was held with tenants, operational staff, and mentors in November 2022. Subsequently, participants were invited to express their ideas and perceptions, pinpointing model strengths and weaknesses, as well as opportunities and threats the model could face. Figure 2 presents the SWOT matrix (Humphrey, 2005) used for this step.

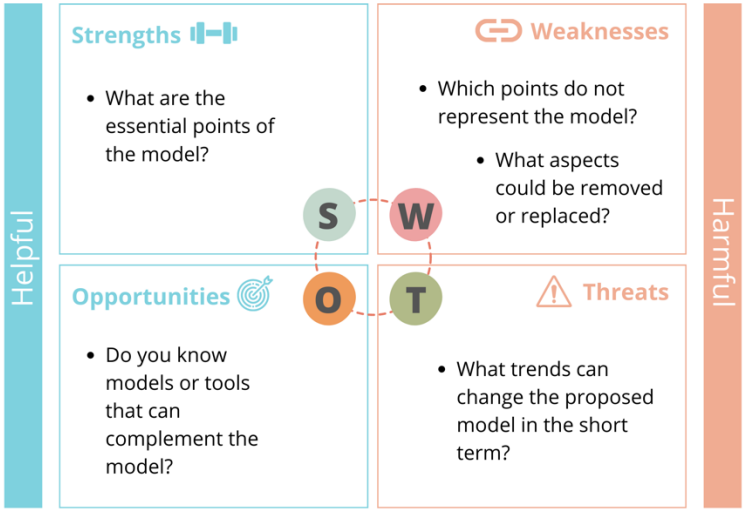


Figure 2 SWOT matrix for model validation
Source: Authors (2022) based on Humphrey (2005)

Revisions and adjustments were performed to refine the model and develop guidelines for reshaping university-linked BIs orientation toward sustainability.

4. Results and discussion

Roman et al. (2018) advocate identifying opportunities, recognizing challenges and barriers, and designing a business model as crucial steps to promote sustainability-oriented frameworks. Each aspect used to develop the theoretical model construct is presented in the following items.

4.1 Drivers and challenges

Several drivers encourage the global trend of sustainability orientation of university-linked innovation environments and start-up communities. This study pointed out the most relevant drivers for BIs and start-ups (Table 1).

Table 1. Drivers toward sustainability orientation

University-linked BIs	Start-up communities
Agenda 2030 and SDGs	ESG investments
Increase support and funds opportunities	Ethical considerations
Role of universities in sustainable development	Importance of education in a sustainable team
Universities' social role	Marketing opportunities
Increased entrepreneurs' awareness of sustainability	Compliance with current or future legislation
Marketing opportunities	Cost-saving strategies
Connections and partnerships	

Increased funding and investments are opportunities for sustainable start-ups in line with SDGs and ESG factors (BSDC, 2017). Start-ups also can create a better image in front of clients (Cullen et al., 2014). Universities have a crucial role in sustainable development and social

challenges, creating an environment that boosts sustainability through education (Leal Filho et al., 2017) and entrepreneurship environments (Redondo and Camarero, 2017).

Despite being a global trend, incubators linked to universities that wish to orient their assets and services toward sustainable development face challenges and barriers, such as lack of expertise, resources, funding, staff interest, support from the university, human capital, physical spaces, financial resources, start-ups interest and understanding, information management, innovation culture, and time to reflect on strategic position. Besides those challenges mentioned, universities' rules and bureaucracies, prejudice about environmental aspects, and the low demand for sustainable start-ups and projects are also barriers for SOBIs. Several scientific studies have pointed out challenges for business incubators and start-ups that aim to shift to sustainability (Buys and Mbewana, 2007; Cullen et al., 2014; Lose and Tengeh, 2015; Mahmood et al., 2017; Nunes et al., 2022).

4.2 Competences for sustainability

The prevalent role of SOBIs is to develop sustainability competences and enable the start-up community to acquire the relevant knowledge, skills, values, and attitudes for sustainable development (Lambrechts et al., 2013). In addition to competences developed in ventures and potential entrepreneurs, BIs staff must have competences to teach sustainable development, encourage visioning of new solutions to current challenges, and practice systems-thinking and a holistic approach. Leal Filho et al. (2019) indicate de importance of education for sustainable development for expertise improvement.

According to Cebrián and Junyent (2014) and Leal Filho et al. (2020), some relevant competences for the sustainability teaching-learning process are:

- Understanding the different scenarios, and possible futures, promoting work with distinct visions for alternative and future changes.
- Taking into account the different dimensions of a problem or action, the spatial dimension (local-global) and the temporal dimension (past, present, and future).
- The ability to identify and connect the ecological, economic, and social dimensions of problems, generating the conditions for systems thinking in the academic environment.
- Creating the conditions for critical thinking to question assumptions and to recognize and respect different trends and views in different situations.
- Moving from awareness to action; sharing responsibilities and engaging in joint activities.
- Values clarification and strengthening behaviour towards sustainability thinking, mutual respect, and understanding other values.
- Developing teaching and learning approaches based on innovation and interdisciplinary.
- Promoting reflection on one's emotions to reach a deeper understanding of problems and situations.

UNECE (2012) proposes four groups of competences to develop sustainability:

- Learning to know – sustainability knowledge: understanding local and global challenges.
- Learning to do: developing practical and action skills.
- Learning to be: developing personal attributes and abilities.
- Learning to live together: working with others and developing partnerships.

The pointed-out competences need to be developed in the BI community (staff for teaching and ventures for learning). In an academic environment, a good part of the teaching staff is prepared and competent regarding sustainability and may be included in this teaching-learning process.

4.3 Support factors for sustainability orientation

The paramount support factors for sustainability-driven entrepreneurship ideation and development are prior knowledge about environmental and social challenges, sustainability orientation (motivation and/or market opportunity), entrepreneurial intention for sustainability, desired value creation from an economic, social, and ecological point of view, perceived social support (value aligned with cultural and environmental components), and perceived business support (profitable, environmental and social value systems) (Muñoz and Dimov, 2015).

Stein and Wickel (2021) reveal that the most relevant support systems for sustainability-oriented incubators are business support through sustainable business model innovation. Sustainable business models are tools that have a greater capacity to obtain achievements that generate social and environmental impacts (López-Nicolás et al., 2018). Nosratabadi et al. (2020) assume sustainability-oriented innovative business models as part of a business strategy that can create, deliver, and capture value in a sustainable and integrative way. Many studies have proposed sustainability-oriented business models, frameworks, or guidelines as follows:

- Lean Startup: the method used to develop or upgrade products and services by means of Agile Culture, Design Thinking, Lean Manufacturing, Minimum Viable Product (MVP), and Customer Development. A core component of the Lean Startup methodology is the build-measure-learn feedback loop (Ries, 2011).
- Value Ideation: concept inspired by Design Thinking to identify value for stakeholders, including society and environment. It comprises value ideation, opportunity selection, and prototyping (Geissdoerfer et al., 2016).
- Value Shaping: sustainability-based innovation concept to identify the financial, social, and environmental value that a business creates by interacting with the different networks. The model comprises five levels: exploring, developing, reframing, redirecting, and extending value (Oskam et al., 2018).

Evans et al. (2017) propose most sustainable business models are based on three fundamental elements: value proposition, value creation and delivery, and value capture. Firstly, the BI is supposed to set up a sustainability-oriented value proposition. From then on, value creation, delivery, and capture will materialize organically through root and cross-cut nutrients. Blueprinting, a Design Thinking tool (Stickdorn and Schneider, 2011), should be used to map traditional BI assets and find gaps to drive sustainability-oriented nurturing services.

4.4 Value proposition

According to Evans et al. (2017), the first step to orienting business incubators toward sustainability is setting up or reviewing their value proposition. Value proposition proclaims the reason for the BI's existence in the sustainability concept. SOBIs have to delimitate a statement communicating their assets benefit the incubatees, asking themselves questions such as "*What are the values BI will provide to the tenants? What are the values business should create?*". Value proposition canvas can be used as a tool to systematize this step. Payne et al. (2020) suggest a holistic framework to develop and shape value propositions. The framework is based on five phases: (1) value design and assessment, (2) value quantification, (3) value communication, (4) value documentation, and (5) value verification and VP review.

When developing a sustainable business model, the BI should examine whether the vision and mission reflect sustainability (Tiemann and Fichter, 2016). Thenceforth, the value proposition will guide the brushing up of BI's mission, vision, objectives, and strategies that must address sustainability principles and align to the foremost social and/or environmental challenges the innovation ecosystem faces.

4.5 Root nutrients

Business incubators are fertile nests for innovation, providing a range of nurturing inputs and assets for a novel business called *nutrients* (Deutschmann, 2007). Incubators committed to sustainability present support facilities tailored and oriented to environmental, social, and economic aspects. UNECE (2021) pinpoints infrastructure, business service, financing, and people connectivity as the most relevant assets for sustainability-oriented business incubators. The first three mentioned are considered primordial services (root nutrients). According to Sanyal and Hisam (2018), the BIs aim to inform and respond to policy needs for economic and socio-economic development, which includes activities such as assessing a company's risk profile, employment, research institutions, and business community, supporting value creation and technology transfer, promoting innovation, improving networks and linkages between universities and government, and developing entrepreneurial clusters.

Infrastructure and management

BIs' infrastructure can be grouped as administrative, secretarial, facilities, and business expertise (Smilor, 1987). Sustainability-oriented business incubators must adapt their infrastructure to make it more environmentally friendly. Green infrastructure favours more

sustainable and resource-efficient activities, promoting multifunctional and mitigating negative impacts from BIs activities (EEA, 2011). The study could pinpoint some practices and elements SOBIs may embody (Table 2). These elements are in line with UNECE (2021) recommendations.

Table 2. Elements for green practices.

Resources	**Infrastructure**	**Waste**	**Management**
- Energy efficiency programs - Full renewable energy use - Water efficient use - Resource-saving programs	- Green building - Green labs	- Management of wastewater - Waste management - Zero waste approach during the events	- Security and safety for workers - Sustainable procurement

To manage proposal selection, SOBIs must develop a set of sustainability metrics and prerequisites. Figure 3 shows some criteria linked to SDGs and ESG factors to evaluate the proposal potential to promote sustainability.

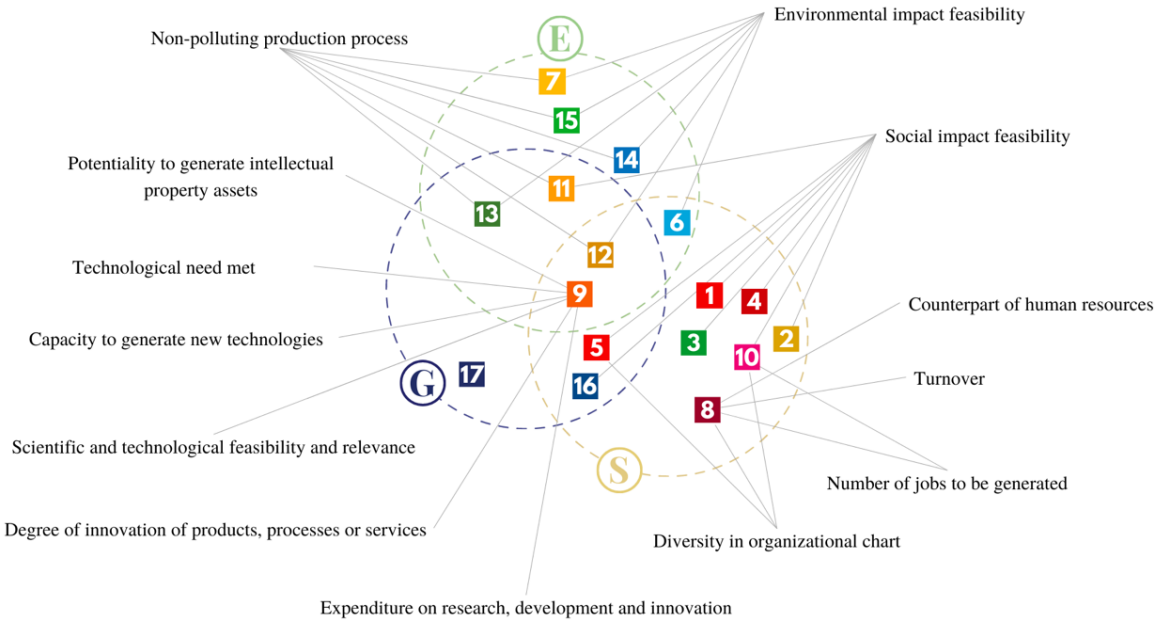


Figure 3 BIs' requirements and criteria for tenants' recruitment and the related SDGs and ESG factors
Source: Authors (2022)

The most valuable enabling factor for university incubators is human capital, followed by financial, organizational, and technological resources. It is also suggested that interaction between incubatees, graduated start-ups, and incubator is essential in transferring technology and market knowledge (Rubin et al., 2015).

Business services

The performance of SOBIs is linked to the offered business services (Bank et al., 2017). Business incubators should reshape their business services to go through the pathway of SOBIs, following sustainability principles, such as honesty, ethics, development of technology, responsible production, resources optimization, impact concern, employees' awareness, and community awareness (Brito et al., 2014).

Ideation is the first step of the start-up development in a business incubator, transforming an idea into a venture. It is crucial in a SOBI to sensitize entrepreneurs to sustainable businesses. Using the right tools to encourage entrepreneurs to address environmental and social impacts while considering financial viability is required during the ideation, incubation, and post-graduation steps. Worldwide some already known or brand-new tools have been adopted as hereafter described.

- Theory of Change: a framework to map the desired long-term goals and then works back from these to identify all the conditions (outcomes) that must be in place (and how these related to one another causally) for the goals to occur. Outcomes Framework is the tool used for it (Weiss, 1995).
- Lean Canvas: visual guide based on Business Model Canvas (Osterwalder & Pigneur, 2011) focused on a model of taking-over disposition manufacture and elimination of process waste. This one-page framework suits the needs/ purposes/requirements of a Lean Startup (Maurya, 2010).
- Sustainable Business Canvas: a framework also based on BMC for ensuring systematic orientation toward sustainability (Tiemann and Fichter, 2016). The integrated model proposes defining the start-up's vision and mission, taking up the guiding idea of sustainability. Two new elements ("competitors" and "stakeholders") were added, analysing external influences that impact the business. Business impacts are discussed using specific questions in each element of the framework (Tiemann and Fichter, 2016).
- Triple-layered Canvas: a BMC-based model with two additional perspectives: the environmental layer (supplies and outsourcing, production, materials, functional value, end-of-life, distribution, use phase, environmental impacts, and environmental benefits) and the social layer (local communities, governance, employees, social value, societal culture, scale of outreach, end-user, social impacts, and social benefits). The integrated use of three layers leads to a more effective capture of how a business generates value at different levels, i.e., the pillars of sustainability (economic, social, and environmental) (Joyce and Paquin, 2016).
- Value Triangle: a framework to capture economic value from a circular value system. The value is co-created and co-delivered, meeting the benefits of customers, partners and suppliers, social actors including the environment and future generations, and the enterprise itself (Biloslavo et al., 2018).

- SDG Project Canvas: a tool inspired by Business Model Canvas (BMC) that helps entrepreneurs consider business impacts, required resources, and funding, co-conceiving and co-designing an integrative Sustainable Development Goals implementation project laid on a business (Wahl, 2019).
- Business Model Canvas for Sustainability: a BMC-based model to map and assess using different colors for economic (blue), environmental (green), and social (yellow) aspects (Cardeal et al., 2020).
- Sustainable Business Model Canvas: a holistic approach addressing the relations within and outside the business. It composes of two directions (Positioning and Operation). As well as, two additional fields are added to BMC (Value proposition, Customer relationships, Channels, Customer Segments, Key partners, Key activities, Key resources, Cost structure, Revenue streams, Eco-social costs, Eco-social benefits) (Carlsson, 2022).
- SDG Action Manager: a brand-new web-based tool to enable businesses to take action and track progress on the Sustainable Development Goals through 2030, developed by B Lab and the United Nations Global Compact. It is a free impact management solution that offers concrete actions for business to improve their positive impact, a performance framework, and supplemental resources to assist the implementation of the actions (UN Global Compact, 2022).

Providing these kinds of tools, BIs can stimulate start-ups to obtain a more comprehensive view of the business model and to what extent it reflects sustainability (Nosratabadi et al., 2020). Successful BIs use multiple tools and approaches to addressing different challenges jointly, encouraging a collaborative culture across the endeavors (1Stop, 2022).

During the expansion phase in the incubation process, SOBIs can adopt the same business services traditional BIs use to provide for nurturing new ventures, such as consultancy, mentorship, research and development services, technological support, risk management support, market research, prototyping, and business continuity plans, among others. Nevertheless, these services have to take up the guiding idea of sustainability.

Financing

The incubators themselves are not financiers but they have to support new ventures to seek financial resources (CBE, 2021). In this sense, BIs have to provide a financing portfolio, fundraising - organizing meetings with venture investors, support to access the ESG financing market, acceleration programs, early-stage funding opportunities, assistance to design an investor-ready business plan, and consultancy to elaborate projects for founding.

4.6 Cross-cut nutrients

Some SOBIs assets and inputs are cross-cutting, permeating the elemental nutrients, such as people connectivity, human resources, and Education for Sustainable Development.

People connectivity

Incubators that provide solid networking activities accelerate the success of the endeavors (1Stop, 2022). BIs have to be able to link entrepreneurial businesses with necessary supporters (CBE, 2021). Learning, exchange of ideas, psychological support, partnership, and business relations are some examples of value to the entrepreneur through services for people connectivity. In addition, incubators play a very instrumental role in connecting entrepreneurs with the proper network that act as a source of ideas, marketing, and financing (CBE, 2021).

Networking, international connections, win-win agreements, interaction with fellow entrepreneurs and market linkages can be promoted by mentorship, coaching, events, business meetings, courses, workshops, lectures, circles of conversation, study groups, training, forums, meetings with successful entrepreneurs, mentors, graduates, among others. Start-ups from the post-incubation program have a great potential to share their learning and knowledge with new incubates (CBE, 2021).

Besides the events and offered services to connect people, BIs should be part of a local or regional innovation ecosystem, share and develop networking, and exchange knowledge and information. Jackson (2011) reveals innovation ecosystems gather actors whose functional goal is to enable, develop and co-create innovation through multi-layer relationships.

Education for Sustainable Development

Education for Sustainable Development (ESD) is the foremost contributor to achieving Global Goals and dealing with sustainability challenges (UNESCO, 2017). ESD empowers learners to take responsible actions for environmental integrity, economic viability, and a just society. Universities play a role in the transformation of individuals, institutions, and societies toward a more sustainable future (Price et al., 2021).

University-linked BIs have the advantage of having experts, researchers, and professors qualified and competent in teaching sustainability principles and developing competences for entrepreneurs to learn about sustainability and address this context in the businesses to be developed. University-linked support programs can improve sustainable entrepreneurship through certain knowledge spillover modes (Wagner et al., 2021) and provide a coordinated and unified understanding of sustainable business models (Tiemann and Fichter, 2016).

Human resources

The knowledge of the incubators' staff impacts the degree of service excellence and specialization (Shakhlova, 2018). Incubation process, as a whole, requires human resources for BIs' management, mentoring and coaching services, and business education. The university-linked BI's staff is considered a university internal structural unit (Slesarev, 2019). In this sense, these BIs dispose university intellectual development and scientific and academic potential.

Slesarev (2019) mentions that usually "the BI team do not contain all the necessary competences for the sustainable development of start-ups. That is why incubators need to form a pool of experts, mentors and industry specialists who can provide residents with comprehensive knowledge on various aspects of business development". Besides the BI staff, successful entrepreneurial community, professionals, experts, and university staff may be involved in SOBIs activities and assets.

Tseng (2011) recommends Human Resource Development (HRD) for the development and management of business incubators. This approach involves improving knowledge, skills, competences, and employees' attitudes (Gerdsri et al., 2021). From the perspective of HRD, the incubator staff learns how to develop incubator facilities, resources, methods, and tools that address the developmental needs of start-ups. HRD prepared under the eye of Education for Sustainable Development is crucial for SOBIs to convey sustainability principles to the endeavors.

4.7 Validation

The workshop lasted one hour and took place at Arena UPF Parque, an innovative environment for the community and innovation ecosystem. Thirteen stakeholders attended the event. Most respondents (52%) were tenants participating in the ideation phase. Thirty-one percent were incubated start-ups, and others were mentors and BI staff.

Regarding the SOBI concept, 62% haven't heard about the terminology. Despite the existing SOBI trend, it was a new concept for most respondents, revealing a limited understanding of sustainable business models, as reported by Bank et al. (2017).

Figure 4 presents the most relevant strengths, weaknesses, opportunities, and threats the respondents pinpointed about the model.

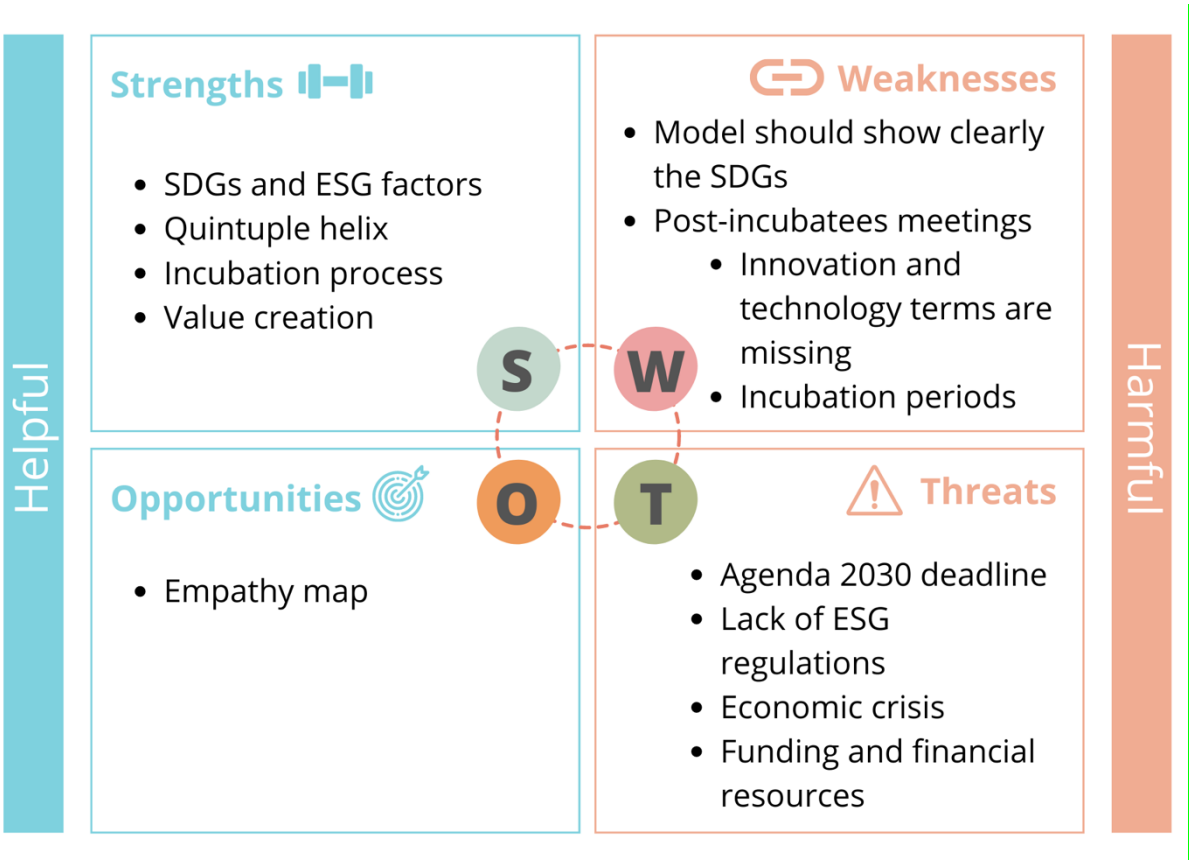


Figure 4 SWOT matrix for the theoretical model
Source: Authors (2022) based on Humphrey (2005)

4.8 Theoretical model and guidance framework

After validation, a constructed figure was prepared to represent the theoretical model for a university-linked SOBI (Figure 5).

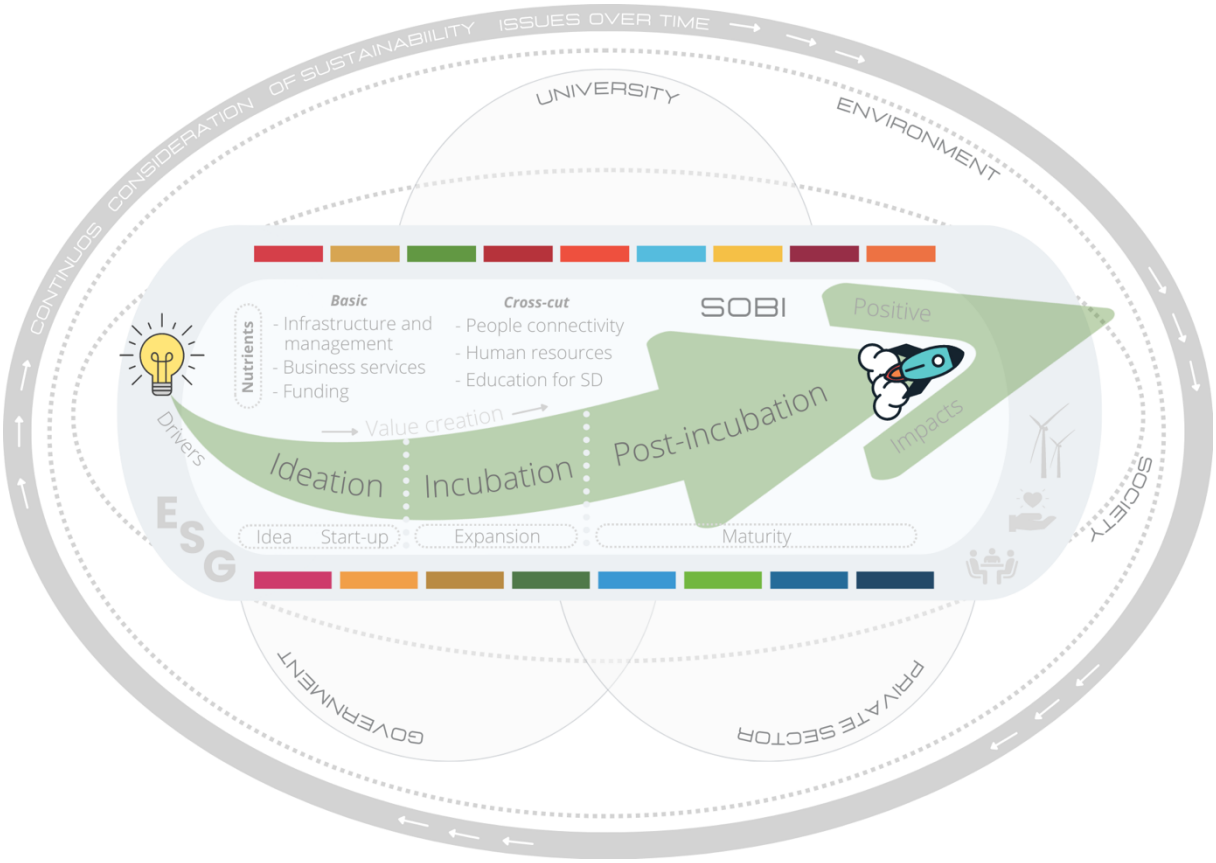


Figure 5 Theoretical model for university SOBIs
Source: Authors (2022)

Business incubators are innovation players inside de quintuple helix (Carayannis and Campbell, 2010). BIs are based on the relationship between the academy, private sector, and government. Society is recognized as an innovation user and consumer. Innovation has to shed light on environmental aspects for humanity's preservation, survival, and vitalization. In this sense, the quintuple helix (university, private sector, government, society, and environment) is the background of SOBIs.

The quintuple helix model can integrate socio-ecological transitions necessary for sustainable development (Carayannis and Campbell, 2010). The quintuple helix model can provide a possible starting point for reflecting on the Sustainable Development Goals (SDGs) and factors of Environment, Social, and Governance (ESG) in general (König et al., 2020).

The Start-up development process in SOBIs has no difference from traditional business incubators, following: ideation (idea to start-up), the incubation (expansion), and post-incubation (maturity). Right from the beginning, sustainability-oriented ideas and projects should address SDGs targets and factors of ESG. Following the incubation phases, the projects create value toward sustainability principles, generating positive social and environmental impacts. Therefore, ventures are able to access potential markets and ESG financing.

SOBIs are focused on value creation concomitant with the incubation process. Value creation belongs to all stages since entrepreneurs can revisit the steps, iterating their business ideas, constantly experimenting, and learning (Stein and Winkel, 2021).

From this model, practical guidelines were prepared to help the university BIs go toward sustainability orientation. Figure 6 presents the guidelines.

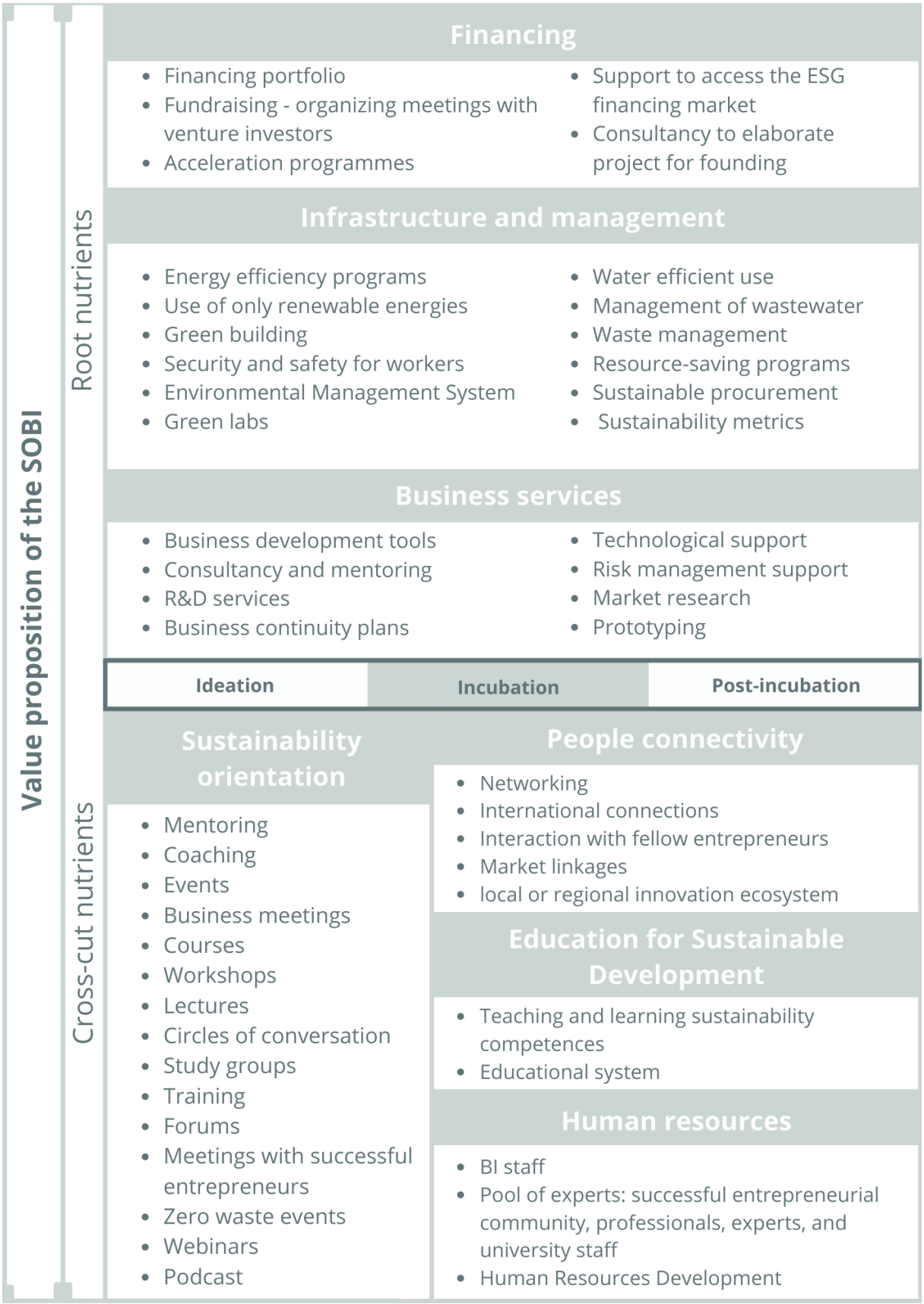


Figure 6 Guidelines for University SOBIs.
Source: Authors (2022)

5. Conclusions

The current study contributes to the development of a theoretical model and practical guidelines for university business incubators to shift their focus toward sustainability, a clear gap not only in the literature and publications but also in practice. The study explores the gaps concerning the emerging theme insofar as it brings together the latest approaches associated with sustainability-oriented business incubators. Final results include elements with profuse details about SOBIs need to recognize for this transition. Hence, this paper contributes to the theory of business incubation modelling and sustainability.

Worldwide, a range of universities has settled innovation environments such as scientific parks, innovation hubs, and business incubators. Business incubators are innovation players helping novel enterprises to overcome the problems and challenges faced in the business first stages and make potential business results and outcomes.

Beginning with the theoretical pattern, the study shows university incubators can provide qualified technological and business orientation for start-ups. The results diagnosed sustainability orientation as a trend and tracked down many drivers leading to this pathway. However, several challenges need to be overcome to take advantage of this movement.

Sustainability-oriented business incubators have the role of developing competences for sustainability in the start-up community and also provide tenants with support factors for business sustainability orientation. The findings indicate some relevant competences to be developed in the BI community for the sustainability teaching-learning process. Business nurturing factors, sustainable business models, and tools were pinpointed to guide SOBIs.

After setting up or reviewing their value proposition in the sustainability concept, SOBIs are supposed to provide their tenants with infrastructure and management, funding, and business services align with sustainability principles (root nutrients) and people connectivity, human resources, and Education for Sustainable Development (cross-cut nutrients). The study described and analysed in detail the nurturing assets SOBIs may develop.

The findings contribute to the idea that university-linked BIs have some benefits compared to traditional ones. They have an educational system behind the innovation environment, allowing them to use it, especially for education for sustainability. Considering the fertile academic atmosphere, SOBIs associated with a university can orient the venture's value proposition toward sustainability. Hence, the reconnaissance of a model concept and a procedure model as initial structured and transparent actions for a transition toward sustainability orientation is another contribution of the paper.

Another implication is the theoretical model comprises innovation ecosystems, quintuple helix, the UN Agenda 2030, and ESG factors as base elements for a SOBI incubation process. Finally,

the model and guidelines provide managers and academics with an insight to facilitate the transition from a non-sustainable BI to a sustainability-oriented one.

The study is an in-deep research. However, it has some limitations, among others methodological challenges. The sample is too small to allow for a broad extrapolation of the results. It cannot be regarded as fully representative. Rather, the data obtained builds a rough profile of how business incubators handle matters related to sustainable development. Against this background, the results have to be interpreted carefully.

The current enduring interest in innovation, sustainability, and the SOBI concept encourages further research. Two main fruitful issues for further inquiry were identified. Firstly, observing whether the theoretical model and guidelines presented by this research may be applied. Another suggestion is to include a more significant number of BIs case studies to compare with this paper's findings.

The present paper nonetheless provides a welcome addition to the literature since it addresses the problem posed by the limited amount of published research on the connections between sustainability and new businesses created with university support.

Declarations

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9. BENCHMARKING FUNCIONAL DE COOPERAÇÃO

O benchmarking funcional de cooperação foi realizado através de uma experiência internacional na Hamburg University of Applied Sciences (HAW Hamburg) através da inserção e participação ativa em um grupo de estudos internacional do Research and Transfer Centre "Sustainability and Climate Change Management" (FTZ-NK) da Fakultät Life Sciences e do um grupo de universidades-membro do Inter-University Sustainable Development Research Programme (IUSDRP).

O objetivo da experiência exploratória permitiu o aprofundamento no conhecimento acerca da temática sustentabilidade, *background* do grupo de pesquisa. Além disso, a HAW e o próprio FTZ-NK realiza diversas parcerias e projetos com empresas no âmbito nacional alemão ou internacional, promovendo inovação orientada para a sustentabilidade. Durante o período de doutoramento sanduíche, alguns destes projetos estavam sendo desenvolvidos tais como: Bio-Plastics Europe, KlimaGESUND, HOOU Online-Course: "The digital introduction of the SDG sinto Higher Education Teaching", HOOU Online Course: Sustainable Tourism on SIDS, FORCE, Climate Change and Emergence of Zika Virus Disease in Fiji, Waste-Ei, BSR Eletric e LARS, sendo este último focado diretamente em processos de especialização inteligente e construção de redes e ecossistemas de inovação nas regiões participantes, apresentando boas práticas e soluções de inovações verdes em empresas regionais. A doutoranda teve a oportunidade de participar mais diretamente deste último, permitindo a compreensão quanto à interação de ecossistemas de inovação com a temática sustentabilidade. Nada obstante, a doutoranda pode acompanhar semanalmente o andamento dos projetos através das reuniões do grupo de trabalho da FTZ-NK, bem como apresentar o andamento do desenvolvimento de seu estudo aos demais participantes e orientandos.

O doutoramento sanduíche permitiu a participação de diversos workshops de capacitação e desenvolvimento e eventos para apresentação do desenvolvimento de seu estudo, tais como: Baltic University Programme VII PhD Students Training; Simpósio "Accelerating the Implementation of Sustainable Development in Campus Activities and Programmes"; Posterpräsentation (apresentação de pôsteres) e BUP Symposium 2020. Além disso, a doutoranda foi convidada a ministrar o workshop "How to adapt the 17 Sustainable Development Goals on your own startup" para as startups da incubadora de empresas HAW Hamburg - GründungsService der HAW Hamburg, bem como interessados em fundar startups ou novos negócios na região metropolitana de Hamburg, Alemanha.

Além dos eventos para a apresentação do estudo da tese, a doutoranda teve a oportunidade de participar de diversos artigos científicos sobre a temática de sustentabilidade junto ao grupo internacional de pesquisa, permitindo contato com especialistas e cientistas internacionalmente renomados e o aprofundamento sobre a temática, especialmente sobre o papel das universidades na promoção do desenvolvimento sustentável.

10. CONSIDERAÇÕES FINAIS

Neste capítulo, os principais resultados do estudo são compilados a fim de discutir suas principais contribuições ao conhecimento, bem como implicações da pesquisa para gerentes e demais à frente das incubadoras de empresa universitárias. Além disso, recomendações para estudos futuros são apresentados ao final.

O objetivo geral do estudo foi desenvolver um modelo teórico e diretrizes que guiem as incubadoras de empresas universitárias através do conceito de sustentabilidade. Para alcançar este objetivo, o estudo buscou responder a seguinte questão:

- Como as incubadoras de empresas universitárias podem orientar para a sustentabilidade e geração de impacto socioambiental as facilidades e serviços ofertados a suas startups?

Os resultados da pesquisa foram apresentados em formato de artigo científico, a fim de facilitar e melhor pontuar as conclusões obtidas ao longo da execução metodológica. Depois de mapear as principais incubadoras de empresas vinculadas a universidades no Brasil e internacionalmente, classificando-as de acordo com seu foco de impacto, os resultados permitiram o desenvolvimento de um artigo científico intitulado "*Sustainability as orientation in university-linked business incubators: fact or fiction?*". Este artigo evidenciou uma crescente, porém ainda incipiente, movimentação tendenciosa em prol da geração de incubadoras universitárias orientadas para a sustentabilidade (SOBI – *Sustainability-oriented Business Incubator*). Este movimento reforça o papel das universidades na quíntupla hélice, um conjunto propulsivo para o desenvolvimento sustentável.

Os resultados da pesquisa demonstram que as principais incubadoras de empresas no Brasil têm se orientado para a sustentabilidade, fato que pode ser atribuído ao Programa de Incubação e Aceleração de Impacto promovido pela ANPROTEC. Desta forma, foi possível concluir que programas focados na preparação de agentes para a sustentabilidade podem encorajar e promover competências fundamentais para conduzir as incubadoras neste caminho, tornando as SOBIs não apenas uma ficção, mas um fato.

Competências devem ser desenvolvidas para a promoção da sustentabilidade. Desta forma, o segundo artigo científico, intitulado "*University teaching staff and sustainable development: an assessment of competences*", identificou competências necessárias para transferir e absorver conhecimento sobre desenvolvimento sustentável em universidades. Os resultados demonstram que apoio institucional e o engajamento da comunidade local são

fundamentais para a Educação para o Desenvolvimento Sustentável (EDS). O estudo também identifica que educadores experientes em EDS podem ministrar treinamento, bem como ser mentores dentro da comunidade acadêmica. O desenvolvimento de competências pode ser fortalecido se for acompanhado pelo desenvolvimento de capacidades nas universidades (Leal Filho et al., 2021).

O terceiro artigo científico visou obter um entendimento sobre como as incubadoras têm considerado e enfatizado assuntos relacionados ao desenvolvimento sustentável, sendo intitulado de "*The potential of university-led incubators in fostering sustainable development"*. Os resultados do estudo demonstraram que muitas universidades têm incubadoras orientadas para geração de tecnologia, porém poucas consideram integralmente aspectos ambientais e sociais em suas operações. Os principais fatores que impulsionam as incubadoras a se orientar para a sustentabilidade foram listados pelo estudo, sendo questões éticas, a importância em formar uma equipe consciente para as questões de sustentabilidade, bem como oportunidades de marketing e mercado. Dentre os principais desafios que as incubadoras enfrentam para seguir este caminho estão a falta de conhecimento e a falta de materiais e recursos. O estudo também pontuou as principais iniciativas que as incubadoras adotam para buscar a orientação sustentável, dentre estes: gestão de recursos (energia, água e resíduos) e aquisições sustentáveis. Através do estudo foi possível trazer recomendações sobre como as incubadoras podem iniciar esta transição, podendo listar: (1) enfatizar os Objetivos do Desenvolvimento Sustentável (ODS) e suas metas na construção de novos negócios; (2) fortalecer relações de troca de informações entre as incubadoras; (3) criar uma estrutura para fornecer informações estruturadas e organizadas sobre como eles podem se beneficiar de uma ênfase no desenvolvimento sustentável. Além disso, as práticas sustentáveis da instituição devem estar alinhadas com as práticas da incubadora, sendo as equipes que atuam nas incubadoras conscientizadas com relação ao empreendedorismo sustentável.

O artigo científico "*How university-led incubators perceive sustainability as an orientation? Fish to fry or a white elephant?*" apresenta uma análise profunda sobre como as incubadoras de empresa percebem a sustentabilidade em suas atuais operações e iniciativas futuras. Os resultados demonstram um forte apelo para a sustentabilidade nos discursos dos entrevistados, porém suas ações são paralelas, desconectadas e desestruturadas, não fazendo parte de um programa como um todo. Vários desafios foram mencionados para justificar esta problemática, dentre estes aspectos estruturais (falta de capital humano, espaços físicos e

recursos financeiros), aspectos culturais (desinteresse das startups e baixa cultura de inovação), aspectos estratégicos (falta de tempo para refletir sobre o negócio, baixa demanda por startups de impacto) e assuntos relacionados ao contexto das próprias universidades (regras e burocracias).

Por outro lado, explorar as tendências de ESG (Environment, Social and Governance) e as metas do ODS impulsionam estes ambientes de inovação a moldar-se orientados para o desenvolvimento sustentável. Além disso, as incubadoras universitárias estão inseridas em um ecossistema acadêmico que detém o conhecimento para a transformação em prol da sustentabilidade. A fim de aproveitar as oportunidades, as incubadoras universitárias devem reformular seu modelo de incubação e inserir-se em ecossistemas de inovação que fortaleçam os ativos ofertados aos incubados.

Observando esta necessidade de remodelar as incubadoras de empresas vinculadas às universidades, o artigo científico "*Reshaping BIs in universities: looking for a theoretical framework and guidelines for sustainability-oriented business incubators*" contribui para o desenvolvimento de um modelo teórico e de um guia prático para que estes ambientes de inovação mudem seu foco para a sustentabilidade. Este estudo congrega todos os resultados encontrados nos artigos anteriormente mencionados, apresentando um modelo visual e didático que norteou o desenvolvimento de modelo de procedimentos práticos e sequenciais para que a remodelagem das incubadoras.

Esta pesquisa proporcionou um estudo profundo sobre incubadoras de empresas associadas a universidades e como elas podem potencializar a temática sustentabilidade em seu core-business aprimorar seus processos e atrair mais clientes, bem como impactar positivamente o meio ambiente e a sociedade que a circunda.

Dentro do contexto de inovação, incubadoras de empresas são agentes e apresentam um papel fundamental para o desenvolvimento de startups promotoras de novas tecnologias, serviços, produtos e modelos de negócios. Neste sentido, as incubadoras de empresas orientadas para a sustentabilidade encontram-se dentro do conceito de quíntupla hélice, a qual prevê a interação da academia (universidades), setor privado (empresas), governo e sociedade em um meio ambiente no seu entorno, promovendo a sustentabilidade de forma orgânica e cíclica através da inovação.

Este novo arquétipo ainda apresenta desafios, barreiras e paradigmas que precisam ser observados e trabalhados para que as SOBIs não se tornem um grande elefante branco no

contexto universitário. Entretanto, foi possível observar que as incubadoras vinculadas a universidades têm um "peixe para fritar" em suas mãos. O estudo observou que incubadoras universitárias possuem um maior potencial de se reorientarem para a sustentabilidade, uma vez que o principal diferencial de uma SOBI para uma incubadora tradicional é a inserção da Educação para o Desenvolvimento Sustentável em seus ativos. As universidades são pioneiras nesta área e contam com diversos especialistas no assunto, os quais podem contribuir para esta readequação.

Implicações nos campos teórico e prático podem ser nitidamente identificadas através desta pesquisa. Entretanto, o estudo apresentou limitações, dentre estas, destaca-se o refinamento das amostras em todas as etapas do estudo. Havia a intenção de analisar incubadoras que já atuam com o viés de sustentabilidade, bem como incubadoras mais renomadas internacionalmente. Entretanto devido a indisponibilidade das mesmas, não foi possível dispor deste grupo de incubadoras como amostra da pesquisa.

O interesse latente sobre SOBI, bem como o recente surgimento deste conceito, ainda proporciona um campo fértil para pesquisas complementares no futuro. Durante o desenvolvimento da pesquisa, foi possível destacar três abordagens que renderiam tanto interessantes resultados acadêmicos, quanto práticos. Um estudo subsequente poderia validar a implementação do modelo e do guia, aplicando na prática estas ferramentas para orientar uma incubadora universitária tradicional para a sustentabilidade. Outra sugestão seria incluir estudos de casos de incubadoras já orientadas para a sustentabilidade, comparando os resultados. Um estudo complementar sobre métricas de avaliação de SOBIs poderia ser realizado a fim de mensurar seu desempenho e encorajar as mesmas a buscar uma melhoria contínua. Estas métricas poderiam ser propostas para premiações classificatórias de incubadoras de empresas, incentivando a abordagem da sustentabilidade em seus modelos de incubação.

O estudo previa responder a seguinte questão: **como as incubadoras de empresas universitárias podem orientar para a sustentabilidade e geração de impacto socioambiental as facilidades e serviços ofertados a suas startups?** As incubadoras de empresas universitárias podem reorientar-se para a sustentabilidade seguindo um modelo teórico descrito na tese, observando princípios de quíntupla hélice, ESG, Agenda 2030 e os objetivos globais, aliados ao processo de incubação tradicional. Neste processo, ativos básicos e ativos transversais devem ser adotados para que o desenvolvimento e suporte a startups de fato norteiem a novos negócios sustentáveis.

Ante o exposto, o estudo atingiu o objetivo de preencher a lacuna de conhecimento científico e prático nesta área, capturando melhores práticas para a orientação de incubadoras universitárias para a sustentabilidade, conferindo um caráter inovador aos resultados da tese. Além disso, corroborou ao desenvolvimento e expansão da linha de pesquisa Planejamento Territorial e Gestão da Infraestrutura do Programa de Pós-graduação em Engenharia Civil e Ambiental da Universidade de Passo Fundo.

Por mais que o objetivo da tese tenha sido atingido, estudos acerca de SOBIs precisam ser aprimorados. Além disso, publicar os resultados e divulgar amplamente estas publicações devem considerados como ações futuras, podendo ser mensurada a aplicabilidade do modelo teórico e do playbook em cases reais, buscando uma melhoria continua no desenvolvimento dos resultados propostos e a identificação de casos de sucesso baseados na aplicação destas diretrizes. Este é o caminho a seguir: “Fry the fish!”

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APÊNDICE A – Questionário quantitativo 1

Competences in Sustainable Development Teaching

1. Your Country:
2. Teaching for:
( ) less than 1 year ( ) between 1-5 years
( ) between 5-10 years ( ) more than 10 years
3. Area(s) you teach: (multiple answers possible)
( ) Social science ( ) Humanities
( ) Natural Sciences ( ) Engineering & Technology
( ) Business ( ) Health ( ) Other:

Learning to know
To what degree do you agree with the following statements:

	Strongly disagree	Disagree	Don't know	Agree	Strongly agree
1. Ecological systems are a set of interrelationships between various organisms and their physical environment.					
2. Issues of poverty, hunger and social inclusion should be addressed separately from environmental protection studies.					
3. Limits on growth must be imposed, because the resources on our planet are finite.					
4. Excessive consumption in one part of the world is causing poverty in another.					
5. Development decisions should be based on scientific evidence rather than cultural concerns.					
6. Sustainable development is an evolving concept.					
7. Achieving sustainable development requires political will and investment.					
8. Citizens have no power if governments do not promote sustainable practices.					
9. Changing unsustainable practices today ensures a better quality of life for the future.					
10. Science and technology provide all the solutions needed to solve problems caused by unsustainable development.					
11. Social sustainability is achieved by overcoming differences of race, gender, class, generation, skills and beliefs.					

In your teaching, how much importance do you give to:

	Very low importance	Low importance	Medium importance	High importance	Very high importance
12. Learning about your students' interests					
13. Encouraging your students to question what they are being taught.					
14. Promoting problem solving.					
15. Encouraging students to be creative and seek new ways to resolve issues.					
16. Structuring your teaching around your students' experiences.					
17. Changing educational structures to promote more learner autonomy.					
18. Trying new learner-centred pedagogies that enhance learning (e.g. project based learning)					
19. Prepare students to meet new challenges in the unforeseen future					
20. Applying concepts to real world problems					
21. Engagement in place-based learning					
22. Giving equal learning opportunities for people with disabilities					

Learning to do

In your teaching, how much importance do you give to:

	Very low importance	Low importance	Average importance	High importance	Very high importance
23. Communicating a sense of urgency to take action for a sustainable future					
24. Evaluating the potential consequences of decisions and actions					
25. Fighting prejudice and preconceptions.					
26. Exploring issues from different (e.g. cultural, religious, social) perspectives					
27. Inspiring hope when faced with the problems caused by unsustainable practices					
28. Becoming a change agent in your community					
29. Using real-world events as a context and source of learning					
30. Framing local issues with global concerns					
31. Anticipating and responding to change					
32. Learning from past experiences					

Learning to live together

In your teaching, how much importance do you give to:

	Very low importance	Low importance	Medium importance	High importance	Very High importance
33. Collaboration with other people within your own department/faculty.					
34. Collaboration with other people from different departments/faculties within your institution.					
35. Collaboration with other people from different institutions.					
36. Challenging unsustainable practices at your educational institution.					
37. Promoting dialogues about different worldviews in the classroom.					
38. Encouraging student acceptance of multiple ways of knowing.					
39. Facilitating student consultation and engagement with the various stakeholders involved in an issue.					
40.Promoting student engagement (e.g. project activities) with different groups (e.g. ages, ethnicity, cultures, beliefs).					

Learning to be

How much importance do you give to the items below, as part of your teaching practices:

	Very low importance	Low importance	Medium importance	High importance	Very high importance
41. Being inclusive of different disciplines, cultures and perspectives.					
42. Inspiring creativity and innovation.					
43. Being a critically reflective practitioner.					
44. Engaging with learners in ways that build positive relationships					
45. Accepting indigenous knowledge as a valid contribution to decision-making.					
46. Feeling motivated to take action to improve the quality of life of other people locally.					
47. Feeling motivated to take action to improve the quality of life of other people globally.					
48. Challenging assumptions underlying unsustainable practice.					
49. Seeking opportunities for self-directed learning.					
50. Questioning (including personal) beliefs and assumptions.					
51. Being sensitive to the feelings and emotions of people during decision making.					
52. Fostering partnerships (internal-external)					

Please let us know if you have any comment or wish to add/highlight anything:

_____

APÊNDICE B – Questionário quantitativo 2

The Potential of University-Led Incubators in Implementing Sustainable Development

This questionnaire is part of an international study undertaken by the European School of Sustainability Science and Research (ESSSR) https://esssr.eu/ and the International Sustainable Development Research Programme (IUSDRP) https://www.haw-hamburg.de/ftz-nk/programme/iusdrp.html, aimed at identifying the extent to which business incubators take into account matters related to sustainable development. We would grateful if you could answer the questions below. It takes between 8 to 10 minutes. All individual answers will be treated with confidentiality, and no personal data is gathered or stored. If you wish to receive a copy of the results, please state so, by using the box at the end of the questionnaire. Thank you.
Regards,
The ESSSR and IUSDRP Teams

Part 1 - Incubator details

1. Name of the Incubator:
2. City
3. Country:
4. Name of university associated with the incubator:

5. For how long has the incubator been operating?
( ) less than 5 years
( ) between 5-10 years
( ) between 10-15 years
( ) more than 15 years

6. How many start-ups have been created from the incubator since it was founded?

( ) less than 50
( ) between 50 to 100
( ) between 100 to 200
( ) more than 200

7. If graduated start-ups are monitored, how many survived “Death Valley”?

( ) less than 10
( ) between 10 to 50
( ) between 50 to 100
( ) more than 100

8. Incubator base/type: (multiple choice possible)
( ) universal (e.g. cover all areas)
( ) technology-oriented
( ) focused on social issues
( ) focused on services
( ) sustainability-oriented
( ) other (please specify): _____

9. Thematic focus of the incubator: (multiple choice possible)
( ) information, communication and technology (ICT)
( ) water resources
( ) aerospace and defense
( ) construction
( ) lawtech
( ) financial sector
( ) creative economy
( ) clothing and textiles
( ) oil and natural gas
( ) biomes and bioeconomics
( ) biotechnology
( ) 4.0 industry
( ) pharmaceutical and cosmetics industry
( ) chemical industry
( ) mechanical industry
( ) retail
( ) electronics
( ) climate and environment
( ) food
( ) energy
( ) education
( ) health and life sciences
( ) agribusiness
( ) other: (please specify):

10. How long is the average pre-incubation period? _____

11. How long is the average incubation period? _____

12. Number of pre-incubated firms: _____

13. Number of incubated firms: _____

14. Number of places available for potential start-ups per year:

( ) 1 to 5
( ) 6 to 10
( ) 11-20
( ) 21-30
( ) over 30

15. Number of places available for start-ups with a focus on socio environmental impact per year:

( ) None
( ) 1 to 5
( ) 6 to 10
( ) 11-20
( ) 21-30
( ) over 30

16. Services offered to companies within the incubator: (multiple choice possible)
( ) support for applications for fundraising and venture capital
( ) legal advice
( ) accounting and financial advice
( ) coaching and mentoring
( ) support for participation in trade fairs and business roundtables
( ) Intellectual property advice
( ) marketing and management advice
( ) support for products and services development
( ) networking support
( ) training and qualifications
(.) physical resources (low cost office space or virtual space, internet access, conference rooms and other shared facilities)
(.) support for commercializing technology
( ) other: _____

Part 2 - Implementing Sustainable Development (SD)

17. Does the selection process of possible start-ups consider environmental and/or social criteria?
( ) To a Great Extent
( ) Somewhat
( ) Very Little
( ) Not at All

18. Are social and environmental impacts evaluated during the performance monitoring of start-ups?
( ) To a Great Extent
( ) Somewhat
( ) Very Little
( ) Not at All

19. Does the incubator promote activities connected to SD learning for start-ups?
( ) To a Great Extent
( ) Somewhat
( ) Very Little
( ) Not at All

20. Is the incubator aware of the UN 2030 Agenda for Sustainable Development and its goals and targets (SDGs)?

( ) Yes ( ) No

21. Are the incubator´s activities linked to the UN 2030 Agenda and its goals and targets (SDGs)?
( ) To a Great Extent
( ) Somewhat
( ) Very Little
( ) Not at All

22. Which may be the main reason(s) for the incubator to promote SD as part of its operations? (multiple choices possible)

( ) Ethical considerations
( ) Compliance with current or future legislation
( ) Importance of educating a sustainable team
( ) Cost-saving strategies
( ) Marketing opportunities
( ) Other:

23. Which elements represent barriers for the implementation of SD in the incubator? (multiple choices possible)
( ) Lack of expertise
( ) Lack of interest from staff
( ) Lack of interest from start-ups
( ) Lack of funding
( ) Lack of materials/resources
( ) Lack of support from the university the start-up is associated with
( ) Other:

24. Does the incubator pursue specific initiatives related to sustainable development?

( ) Yes ( ) No

If so, which ones (multiple choices possible)

( ) Energy savings programmes
( ) Water management programmes
( ) Waste management programmes
( ) Sustainable procurement

APÊNDICE C – Codificação das questions

The Potential of University-Led Incubators in Implementing Sustainable Development

Q1 - Name of the Incubator:
Q2 - City
Q3 - Country
Q4 - Name of university associated with the incubator
Q5 - For how long has the incubator been operating?
Q6 - How many start-ups have been created from the incubator since it was founded?
Q7 - If graduated start-ups are monitored, how many survived "Death Valley"?
Q8 - Incubator base/type: (multiple choice possible)
Q9 - Thematic focus of the incubator: (multiple choice possible)
Q10 - How long is the average pre-incubation period?
Q11 - How long is the average incubation period?
Q12 - Number of pre-incubated firms
Q13 - Number of incubated firms
Q14 - Number of places available for potential start-ups per year
Q15 - Number of places available for start-ups with a focus on socio-environmental impact per year
Q16 - Services offered to companies within the incubator
Q17 - Does the selection process of possible start-ups consider environmental and/or social criteria?
Q18 - Are social and environmental impacts evaluated during the performance monitoring of start-ups?
Q19 - Does the incubator promote activities connected to SD learning for start-ups?
Q20 - Is the incubator aware of the UN 2030 Agenda for Sustainable Development and its goals and targets (SDGs)?
Q21 - Are the incubator's activities linked to the UN 2030 Agenda and its goals and targets (SDGs)?
Q22 - Which may be the main reason(s) for the incubator to promote SD as part of its operations? (multiple choices possible)
Q23 - Which elements represent barriers for the implementation of SD in the incubator? (multiple choices possible)
Q24 - Does the incubator pursue specific initiatives related to sustainable development?
Q25 - If so, which ones (multiple choices possible)

APÊNDICE D – Roteiro da entrevista semi-estruturada em portugûes

Roteiro semiestruturado de entrevistas

Categoria 1: Informações gerais

1) Conte como foi o início das atividades da incubadora, dificuldades, experiências vivenciadas, etc.

2) Como foram eleitas as áreas prioritárias da incubadora, comente quais são.

3) Qual(is) entidades gerencia(m) a mesma? Se for mais de uma, como se formou este grupo?

4) Como a estrutura de pessoas da incubadora é composta (funcionários, mentores, consultores, etc.)?

5) Quantas startups estão incubadas (incubação interna/externa e pré-incubação)? Qual é a capacidade de incubação?

6) Do seu ponto de vista, quais os principais desafios para a incubadora que vocês visualizam no futuro?

Categoria 2: Processo de incubação e avaliação das startups

1) Quais são as fases do processo de incubação em sua incubadora? Como é o fluxograma do processo? Quais as ferramentas utilizadas em cada fase do processo (ex. para o processo seletivo e atração de empresas: editais, chamadas públicas, websites, contato telefônico, contato virtual, eventos, etc.)? (esboçar um fluxograma com o entrevistado e solicitar cópia de documentos abertos)

2) A incubadora avalia as startups em cada fase? Como é o processo de avaliação para cada fase? Existem ferramentas para avaliação? Quais os critérios utilizados para cada avaliação?

Categoria 3: Incubadoras e o desenvolvimento sustentável

1) Você conhece o termo "incubadora voltada para o desenvolvimento sustentável" ou "incubadora de impacto"? Se sim, o que poderia caracterizar este tipo de incubadora, considerando a sua opinião?

2) Considerando uma incubadora voltada para o desenvolvimento sustentável, quais os pontos positivos que você destaca.

3) Considerando uma incubadora voltada para o desenvolvimento sustentável, quais os pontos negativos evidenciados conforme sua experiência.

4) Você considera sua incubadora voltada para o desenvolvimento sustentável? Quais os motivos que o levam a esta conclusão?

5) A sua incubadora já participou de algum programa ou evento voltado a incubadoras e/ou startups orientadas ao desenvolvimento sustentável? Se sim, comente sobre essa experiência?

6) A sua incubadora tem conhecimento da Agenda 2030 e dos seus Objetivos do Desenvolvimento Sustentável? Se sim, estes são considerados em suas atividades? Você considera importante inserir os conceitos e premissas nas estratégias, atividades e práticas da incubadora? Cite exemplos.

7) Quais os fatores que motivam uma incubadora a promover startups que contribuam para o desenvolvimento sustentável?

8) Na sua opinião, promover startups que contribuam com o desenvolvimento sustentável é uma realidade para as incubadoras de empresas? Como você percebe isso? Por favor, explique.

9) Você acredita que as incubadoras de empresas estão preparadas para identificar potenciais startups que contribuam com o desenvolvimento sustentável? Explique ou exemplifique seu entendimento sobre isso.

Você tem mais algum comentário que queira fazer ou que possa contribuir com a pesquisa?

Caso tenha algum documento, algum dado importante que queira comentar ou apresentar que ainda não tenha sido abordado na entrevista, por favor, fique à vontade para demonstrar.

Obrigada por sua colaboração com a pesquisa!

APÊNDICE E – Roteiro da entrevista semi-estruturada em inglês

Interview script

Tier 1: General information

1) Please, tell me how was the begging of the incubator, the main difficulties, lived experiences, etc.

2) How was selected the main incubator's areas? Please, tell me which ones are a priority for the incubator?

3) Who owns or manages the incubator? If it is more than one, please tell me how this group started.

4) How is the incubator's staff composed (employees, consultants, advisors, mentors, etc.)?

5) How many start-ups are incubated currently (intern/extern incubation and pre-incubation)? How many places does the incubator have for incubation and pre-incubation?

6) In your point of view, which challenges do you see for the incubator in the future?

Tier 2: Incubation process and assessment

1) Which steps does the incubator adopt for the start-up development process? How is the process' flow? Which tools are used in each step (E.g. for the selection process and start-ups' attraction: notices and calls, websites, phone calls, virtual contact, events, formularies, etc.)?

2) Does the incubator evaluate the start-ups in each step? How is the evaluation process in each step? Are there evaluation' tools? What are the criteria for each evaluation process?

Tier 3: Incubators and sustainable development

1) Do you know the concept of "sustainable-oriented incubator" or "impact incubator"? If so, according to your opinion, how do you characterize this kind of incubator?

2) Considering a sustainable-oriented incubator, which positive aspects you could point out?

3) Considering a sustainable-oriented incubator, which negative aspects you could point out, according to your experience?

4) Do you consider this incubator sustainable-oriented? What are the reasons to consider it?

5) Has this incubator attended any kind of program or event that promotes sustainable-oriented incubators or start-ups? If so, could you tell me this experience?

6) Does the incubator know UN Agenda 2030 and its Sustainable Development Goals (SDG)? If so, has the incubator considered it in its activities? Do you believe it is important to insert the SDGs in incubators' strategies, activities, and practices?

7) What reasons motivate incubators to promote sustainable-oriented start-ups?

8) In your opinion, is it possible for incubators to promote sustainable-oriented start-ups? How do you realize that?

9) Do you believe that incubators are prepared to identify potential start-ups to promote positive sustainable development impacts? Please, explain your understanding of this.

Do you have any other comments you would like to make or that you can contribute to the research?

If you have any documents, important data that you would like to comment on or present, please feel free to demonstrate.

Thank you for your collaboration with this research!

APÊNDICE F – Material visual utilizado no workshop de validação

Incubadoras e negócios orientados para a sustentabilidade

Barbara Fritzen

O que é

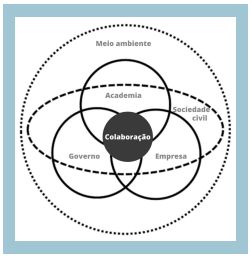
Sustenta bilidade?

O que são

Startups sustentáveis?

Start-up sustentável

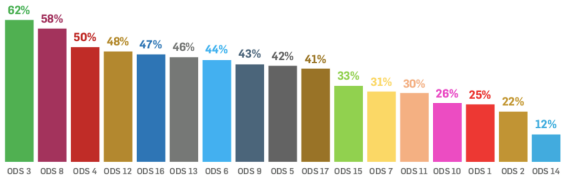
visam à solução de problemas socioambientais com eficiência e à sustentabilidade financeira por meio de mecanismos de mercado



Agenda 2030

17 Objetivos do Desenvolvimento Sustentável

ODS nas ações estratégicas das empresas brasileiras



Fonte: Adaptado de UNGC; PNUD; PRME (2018).

ESG

Environment, Social, and Governance

Competências para a sustentabilidade

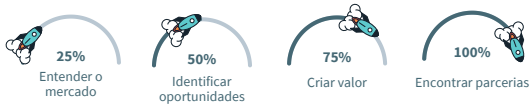
Learning to know
Endender desafios locais e globais

Learning to do
Desenvolver habilidades práticas e de ação

Learning to be
Desenvolver atributos e habiidades pessoais

Learning to live together
Trabalhar com outros e desenvolver parcerias

Como desenvolver startups sustentáveis



Nutrientes básicos

Fundos de fomento e financiamento

- Portfolio de fontes de fomento e financiamento
- Organização de reuniões com investidores
- Programas de aceleração
- Consultoria para elaboração de projetos
- Suporte para acesso a mercados de financiamento ESG

Nutrientes básicos

Infraestrutura e gestão

- Programas de eficiência energética
- Uso de energias renováveis
- Construção verde
- Saúde e segurança ocupacional
- Gestão ambiental
- Laboratórios sustentáveis
- Uso eficiente de água
- Gestão de resíduos e efluentes
- Programas de redução de consumo
- Métricas de sustentabilidade
- Condutas sustentáveis

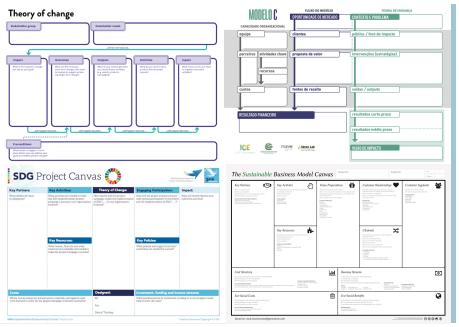
Nutrientes básicos

Serviços ofertados

- Ferramentas de modelagem de negócio
- Consultoria e mentoria
- Serviços de pesquisa e desenvolvimento
- Planos de continuidade dos negócios
- Suporte tecnológico
- Apoio para gestão de riscos
- Pesquisas de mercado
- Prototipagem

Ferramentas

Exemplos de ferramentas para modelagem de negócios de start-ups orientadas à sustentabilidade



Nutrientes transversais

Conexão de pessoas

- Networking
- Conexões internacionais
- Interação com empreendedores
- Conexões com o mercado
- Ecossistema de inovação local ou regional

Nutrientes transversais

Recursos humanos

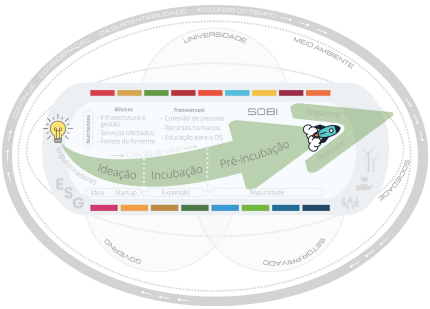
- Equipe da incubadora
- Grupo de especialistas, empreendedores consolidados, profissionais, especialistas e comunidade acadêmica
- Desenvolvimento de recursos humanos

Nutrientes transversais

Educação para o Desenvolvimento Sustentável

- Competências para ensino e aprendizagem sobre educação
- Sistema educacional da universidade

Modelo de incubadora de empresas vinculada a sustentabilidade orientada para a sustentabilidade




O que achou?
Deixe a sua opinião no formulário

APÊNDICE G – Playbook para SOBIs vinculadas a universidades

Sustainaibity-oriented business incubators in universities

A guide for a fresh start

SUSTAINABILITY-ORIENTED BUSINESS INCUBATORS IN UNIVERSITIES:
a guide for a fresh start

University of Passo Fundo
Brazil, 2022

Barbara Fritzen
Luciana L. Brandli
Walter Leal Filho

Table of contents

Foreword

Socio-economic, environmental, technological, and cultural transformations are occuring at all levels, ever more rapidly. One of the most challenging issues is how to balance economic development with environmental sustainability and social justice, a complex question that must be faced in a systemic and horizontal way, leading to the so-called sustainable development. Innovation, from both developed and developing countries, is a trandformational driver and a prerequisite for achieving sustainable develolpment.

Sustainability-oriented Business Incubators (SOBIs), as innovation environments, are crucial elements to support, incentive, foster, and develop would-be-innovative entrepreneurs toward sustainability, promoting and catalising sustainability-led thinking in the start-up community oriented.

This Playbook is a guide for a fresh start of university-linked business incubators that want to reorient their value proposition toward innovation ecosystem to promote social and environmental impacts. The findings in this publication draw upon lessons learned from incubators practices worldwide and target university incubators, providing reccomendations and tools, step-by-step, for a fresh start looking at the sustainability issues of the future.

This Playbook is also an important outcome of the framework of the doctoral project “Proposal of a theoretical model and guidelines for university sustainability-oriented business incubators”, carried out jointly with the Post-Graduation Program in Civil and Environmental from University of Passo Fundo (Brazil) and the Inter-University Sustainable Development Research Programme from Hochschule für Angewandte Wissenschaften Hamburg (Germany).

Barbara Fritzen
Luciana L. Brandli
Walter Leal Filho

Sustainability-oriented Business Incubator (SOBI)

SOBIs are innovation environments that implement sustainability thinking and the related principles in the start-up community and hence play a significant role in reorienting ventures towards sustainability (Bank et al., 2017). In this sense, the fourth generation of business incubators is emerging, continuing the timeline proposed by Bruneel et al. (2012) and UNECE (2021), as shown in Figure 1. This new generation's value proposition is the insertion of business incubators within an ecosystem that strengthens and promotes social and environmental impacts while observing key aspects of business financial sustainability.

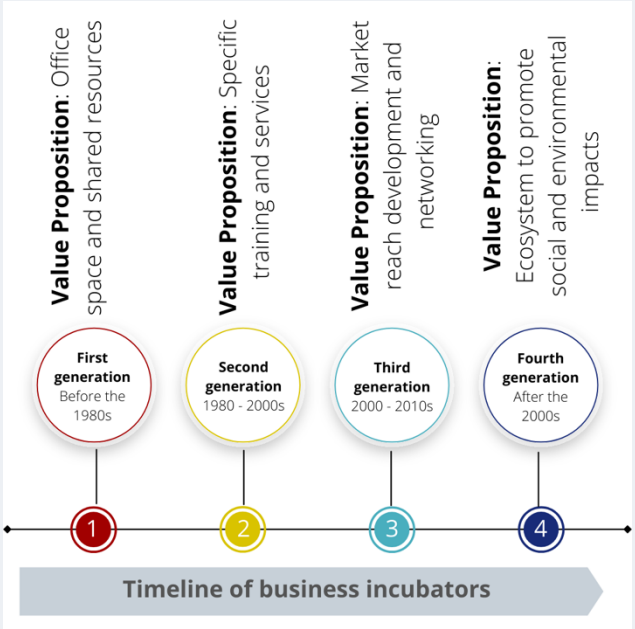


Fig. 2 Timeline of business incubators.
Source: Authors based on Bruneel et al. (2012) and UNECE (2021).

Business incubators are innovation players inside de quintuple helix (Carayannis and Campbell, 2010). BIs are based on the relationship between the academy, private sector, and government. Society is recognized as an innovation user and consumer. Innovation has to shed light on environmental aspects for humanity's preservation, survival, and vitalization. In this sense, the quintuple helix (university, private sector, government, society, and environment) is the background of SOBIs.

The quintuple helix model can integrate socio-ecological transitions necessary for sustainable development (Carayannis and Campbell, 2010). The quintuple helix model can provide a possible starting point for reflecting on the Sustainable Development Goals (SDGs) and factors of Environment, Social, and Governance (ESG) in general (König et al., 2020).

The Start-up development process in SOBIs has no difference from traditional business incubators, following: ideation (idea to start-up), the incubation (expansion), and post-incubation (maturity). Right from the beginning, sustainability-oriented ideas and projects should address SDGs targets and factors of ESG. Following the incubation phases, the projects create value toward sustainability principles, generating positive social and environmental impacts and they are able to access potential financing and markets.

SOBIs are focused on value creation concomitant with the incubation process. Value creation belongs to all stages since entrepreneurs can revisit the steps, iterating their business ideas, constantly experimenting, and learning (Stein and Winkel, 2021).

Figure 2 presents a theoretical model bringing together all aspects mentioned above.

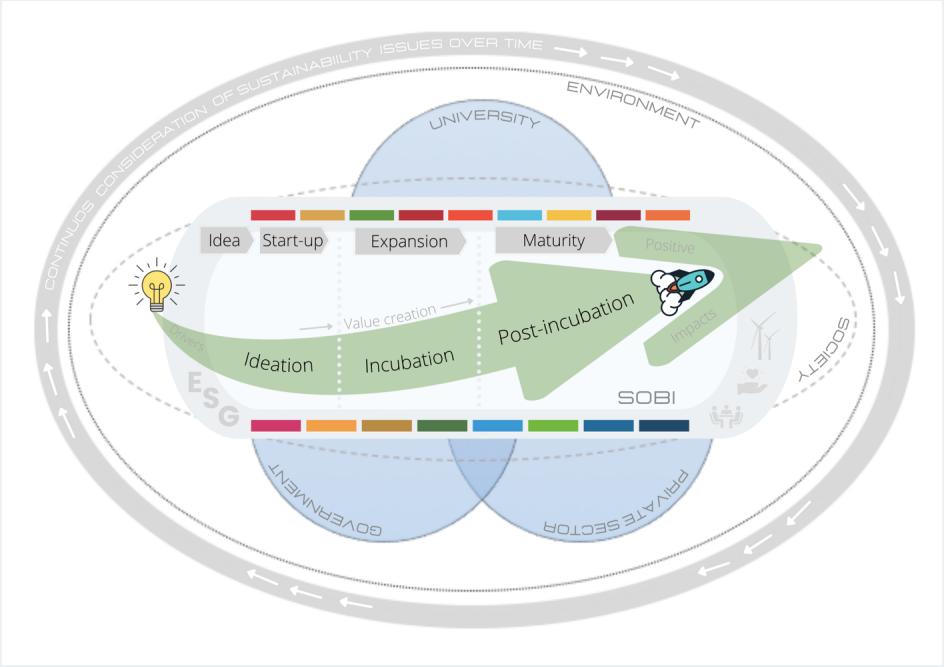


Fig. 2 SOBI theoretical model.
Source: Authors (2022)

The search for a sustainable future presents challenges and opportunities that encourage innovative sustainability-oriented initiatives.

Drivers

Several drivers encourage the global trend of sustainability orientation of university-linked innovation environments, such as:

- Agenda 2030 and SDGs
- Increase support and funds opportunities
- Role of universities in sustainable development
- Universities' social role
- Increased entrepreneurs' awareness of sustainability
- Marketing opportunities
- Connections and partnerships

For start-ups community to reorient themselves toward sustainability, drivers can also be pinpointed, such as:

- ESG investments
- Ethical considerations
- Importance of education in a sustainable team
- Marketing opportunities
- Compliance with current or future legislation
- Cost-saving strategies

Challenges

Despite being a global trend, incubators linked to universities that wish to orient their assets and services toward sustainable development face several challenges, such as:

- Lack of expertise or support capacity
- Lack of materials/ resources
- Lack of funding

- Lack of interest from staff
- Lack of support from the university
- Lack of human capital
- Lack of physical spaces
- Lack of financial resources
- Lack of start-ups' interest and understanding
- Lack of information management
- Lack of innovation culture and cultural aspects
- Universities' rules and bureaucracies
- Lack of time to reflect on strategic issues
- Prejudice about environmental aspects
- Law demands on sustainable start-ups and projects

Competences for sustainability

The foremost role of SOBIs is to develop competences for sustainability and enable the start-up community to acquire the important knowledge, skills, values, and attitudes for sustainable development (Lambrechts et al., 2013).

In addition to competences developed in ventures and potential entrepreneurs, BIs staff must have competences to teach sustainable development going beyond being instructors of specific content, encouraging visioning of new solutions to current challenges, and practicing systems-thinking and holistic approach.

According to Cebrián and Junyent (2014) and Leal Filho et al. (2020), some relevant competences for the sustainability teaching-learning process are:

- Understanding the different scenarios, and possible futures, promoting work with different visions and scenarios for alternative and future changes
- Taking into account the different dimensions of a problem or action, the spatial dimension (local-global) and the temporal dimension (past, present, and future)
- The ability to identify and connect the ecological, economic, and social dimensions of problems. Generate the conditions for systems thinking in the school environment

- Creating the conditions for critical thinking to question assumptions and to recognize and respect different trends and views in different situations
- Moving from awareness to action; sharing responsibilities and engaging in joint action
- Values clarification and strengthening behavior towards sustainability thinking, mutual respect, and understanding of other values
- Developing teaching and learning approaches based on innovation and interdisciplinarity
- Promoting reflection on one's own emotions as a means to reach a deeper understanding of problems and situations

UNECE (2012) proposes four groups of competences to develop sustainability:

- *Learning to know – sustainability knowledge*: understanding of local and global challenges
- *Learning to do*: developing practical and action skills
- *Learning to be*: developing personal attributes and abilities
- *Learning to live together*: working with others and developing partnerships

The pointed-out competences need to be developed in the BI community (staff for teaching and ventures for learning). University teaching staff prepared and competent to teach may be inserted in this sustainability teaching-learning process.

Support factors for sustainability orientation

The paramount support factors for sustainability-driven entrepreneurship ideation and development are prior knowledge about environmental and social challenges, sustainability orientation (motivation and/or market opportunity), entrepreneurial intention for sustainability, desired value creation from an economic, social, and ecological point of view, perceived social support (value aligned with cultural and environmental components), and perceived business support (profitable, environmental and social value systems) (Muñoz and Dimov, 2015).

Stein and Wickel (2021) reveal that the most relevant support systems for sustainability-oriented incubators are business support (business model support and market research support) and financing (access to external debt, equity financing and grants, and market research support).

Value proposition

Setting up or reviewing value propositions is crucial to orient business incubators towards sustainability. *What are the values BI will provide to the tenants? What are the values business should create?*

Mission, vision, and objectives must be brushed up addressing sustainability principles align to the foremost social and/or environmental challenges the innovation ecosystem faces.

Root nutrients

Business incubators are fertile nests for innovation. Nurturing this environment, the incubation process needs inputs and assets, composing a set of basic “nutrients”. Incubators committed to sustainability present support facilities tailored and oriented to environmental, social, and economic aspects.

UNECE (2021) pinpoints infrastructure, business service, financing, and people connectivity as the most relevant assets for business incubators. The first three mentioned are considered primordial services (root nutrients).

Infrastructure and management

BIs’ infrastructure can be grouped as administrative, secretarial, facilities, and business expertise (Smilor, 1987). Sustainability-oriented business incubators must adapt their infrastructure to make it more environmentally friendly. Green infrastructure favors more sustainable and resource-efficient activities, promoting multifunctionality and mitigating negative impacts from BIs activities. Some practices and elements BIs may embody are:

- Energy efficiency programs
- Use of only renewable energies
- Green building
- Security and safety for workers
- Environmental Management System (EMS)
- Green labs
- Water efficient use
- Management of wastewater
- Waste management
- Resource-saving programs
- Sustainable procurement
- Zero waste approach during the events

For the management of recruitment and selection of the proposals, SOBIs have to develop a set of sustainability metrics. Figure 3 shows some criteria linked to SDGs and ESG factors to evaluate the potential of the proposal to promote sustainability.

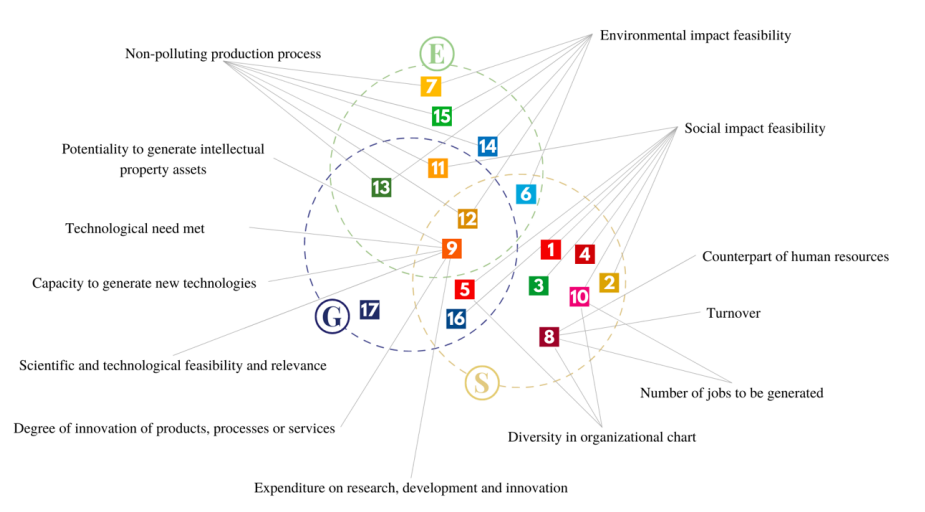


Fig. 3 BIs' requirements and criteria for tenants' recruitment and the related SDGs and ESG factors
Source: Authors (2022)

Business services

The performance of SOBIs is linked to the offered business services (Bank et al., 2017). To become SOBI, incubators have to reshape their business services following sustainability principles, such as (Brito et al., 2014):

- Honesty
- Social justice
- Ethics
- Development of technology
- Responsible production
- Resources optimization
- Impact concern
- Employees awareness
- Community awareness

Ideation is the first step of start-up development in a business incubator, transforming an idea into a venture. This phase is crucial in a SOBI, as it will sensitize entrepreneurs to shape sustainable businesses. The use of correct tools that encourage entrepreneurs to address environmental and social impacts while considering the business's financial viability is required not only for ideation but for ventures and graduates that want to improve their positive impact. Some already known or brand-new tools have been developed worldwide as hereafter described.

- Lean Canvas: visual guide based on Business Model Canvas and focused on the elimination of process waste. It uses the same nine blocks concept except they've been modified slightly to suit the needs/ purposes/requirements of a Lean Startup.

- Lean Startup: the method used to develop or upgrade products and services by means of Agile Culture, Design Thinking, Lean Manufacturing, Minimum Viable Product (MVP), and Customer Development. A core component of Lean Startup methodology is the build-measure-learn feedback loop.

- SDG Project Canvas: the process of co-conceiving and co-designing an integrative Sustainable Development Goals implementation project with a business in mind. This tool is inspired by Business Model Canvas and helps entrepreneurs think about the business impacts, required resources, and funding.

- Sustainability Business Model Canvas: tool to represent innovative and sustainable business models. Besides the 9 elements of Business Model Canvas, three elements are added representing the three different dimensions of sustainability (environmental, economic, and social impacts).

- Sustainable Business Model Canvas: holistic approach regarding the relations within and outside the business. It is composed of Value proposition, Customer relationships, Channels, Customer Segments, Key partners, Key activities, Key resources, Cost structure, Revenue streams, Eco-social costs, and Eco-social benefits.

- Theory of Change: It identifies the desired long-term goals and then works back from these to identify all the conditions (outcomes) that must be in place (and how these related to one another causally) for the goals to occur. Outcomes Framework is the tool used for it.

- C Model: it helps to align the teams of social impact businesses around their purpose and business model. This approach integrates the Business Model and Theory of Change.

Successful BIs use multiple tools and approaches to addressing different challenges jointly, encouraging a collaborative culture across the endeavors (1Stop, 2022). A brand-new web-based tool to enable businesses to take action and track progress on the Sustainable Development Goals through 2030, developed by B Lab and the United Nations Global Compact, the SDG Action Manager. It is a free impact management solution that offers concrete actions for business to improve their positive impact, a performance framework, and supplemental resources to assist the implementation of the actions (UN Global Compact, 2022).

During the expansion phase in the incubation process, SOBIs can adopt the same business services traditional BIs use to provide, such as consultancy, mentorship, research and development services, technological support, risk management support, market research, prototyping, and business continuity plans, among others.

Financing

The incubators themselves are not financiers but they have to support new ventures to seek financial resources (CBE, 2021). In this sense, BIs have to provide a financing portfolio, Fundraising - organizing meetings with venture investors, support to access the ESG financing market, acceleration programs, early-stage funding opportunities, assistance to design an investor-ready business plan, and consultancy to elaborate projects for foundings.

Cross-cut nutrients

Some SOBIs assets and inputs are cross-cutting, in other words, they permeate the basic nutrients, such as people connectivity, human resources, and Education for Sustainable Development.

People connectivity

Incubators that provide solid networking activities accelerate the success of the endeavors (1Stop, 2022). BIs have to be able to link entrepreneurial businesses with necessary supporters (CBE, 2021). Learning, exchange of ideas, psychological support, partnership, and business relations are some examples of value to the entrepreneur through services for people connectivity. In addition, incubators play a very instrumental role in connecting entrepreneurs with the right networks, that act as a source of ideas, marketing, and financing (CBE, 2021).

Networking, international connections, win-win agreements, interaction with fellow entrepreneurs, and market linkages can be promoted by mentorship, coaching, events, business meetings, courses, workshops, lectures, circles of conversation, study groups, training, forums, meetings with successful entrepreneurs, mentors, graduates, among others. Start-ups from the post-incubation program have a great potential to share their learning and knowledge with new incubates (CBE, 2021).

Besides the events and offered services to connect people, BIs have to be part of a local or regional innovation ecosystem, share and develop networking, and exchange knowledge and information. Jackson (2011) reveals innovation ecosystems gather actors whose functional goal is to enable, develop and co-create innovation through multi-layer relationships.

Education for Sustainable Development

Education for Sustainable Development (ESD) is the foremost contributor to achieving the Global Goals and dealing with sustainability challenges (UNESCO, 2017). ESD empowers learners to take responsible actions for environmental integrity, economic viability, and a just society. Universities play a role in the transformation of individual, institutions and societies toward more sustainable future (Price et al., 2021).

University-linked BIs have the advantage of having experts, researchers, and professors qualified and competent on teaching sustainability principles and developing competences on entrepreneurs to learn about sustainability and address this context in the businesses to be developed. University-linked support programs can improve sustainable entrepreneurship through certain knowledge spillover modes (Wagner et al., 2021).

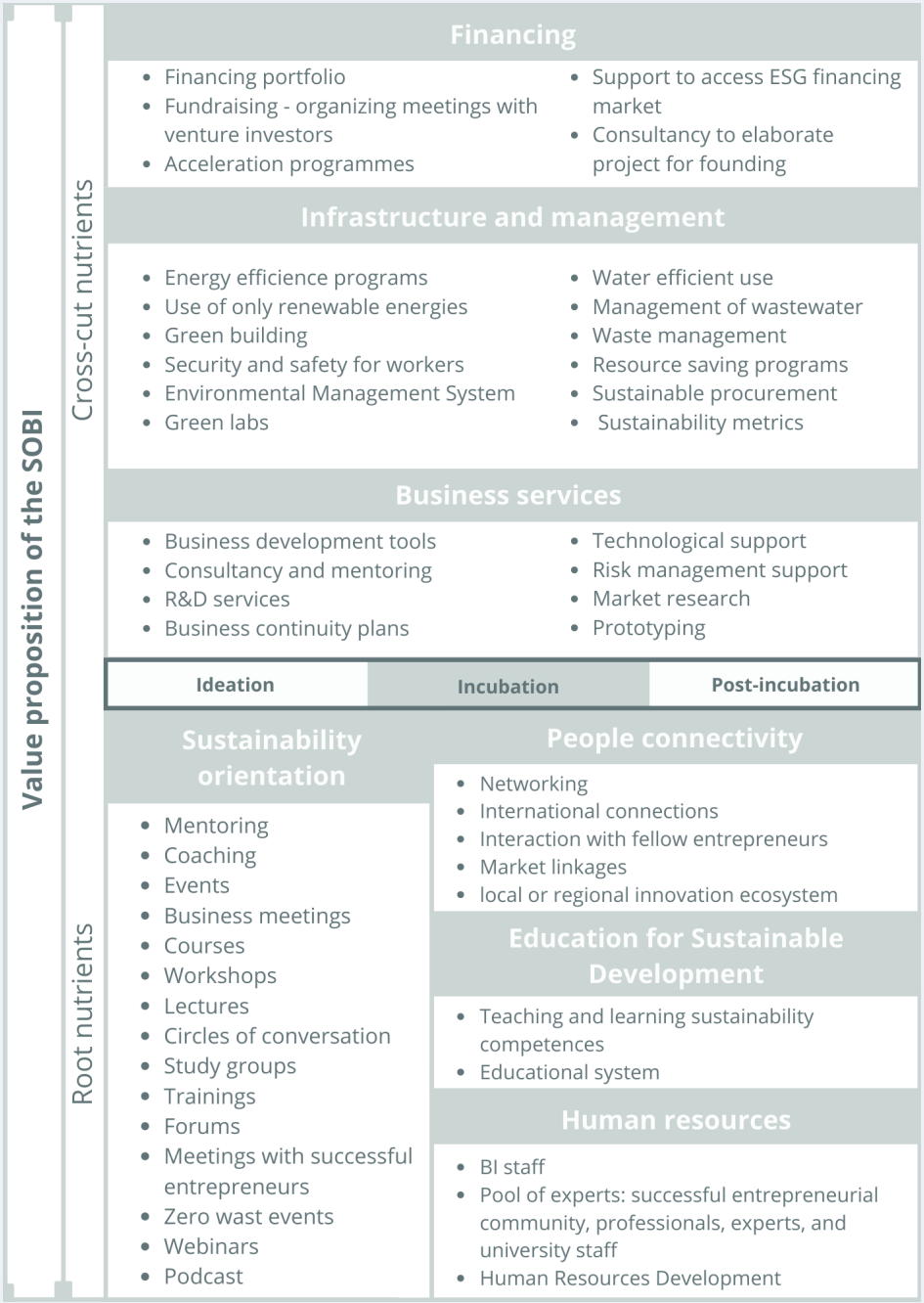
Human resources

The incubators' proprietary knowledge body impacts the degree of service excellence and specialization (Shakhlova, 2018). Human resources are required during all the incubation process. Business incubator management and services of mentoring, coaching, and business education only occur with human resources. In university-linked BIs, the main feature of the staff is an internal structural unit of the university. (Slesarev, 2019). In this sense, these BIs dispose intellectual development and scientific and academic potential of the university.

Slesarev (2019) mentions that "the BI team cannot contain all the necessary competences for the sustainable development of start-ups. That is why it is very important for incubators to form a pool of experts, mentors and industry specialists who can provide residents with comprehensive knowledge on various aspects of business development". Besides the BI staff, successful entrepreneurial community, professionals, experts, and university staff may be involved in SOBIs activities and assets.

Tseng (2011) recommends Human Resource Development (HRD) for the development and management of business incubators. This approach involves the improvement of knowledge, skills, competences, and attitudes among employees (Gerdsri et al., 2021). From the perspective of HRD, the incubator staff learn how to develop incubators facilities, resources, methods, and tools that address the developmental needs of start-ups. In this sense, HRD prepared under the eye of Education for Sustainable Development is a crucial factor for SOBIs convey the principles of sustainability to the endeavors.

Guidance framework



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Sustainability-oriented business incubators in universities: a fish to fry

ANEXO A – Artigo científico publicado "*University teaching staff and sustainable development: an assessment of competences*"

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ORIGINAL ARTICLE

University teaching staff and sustainable development: an assessment of competences

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Abstract
Teaching about matters related to sustainable development requires not only a personal motivation from educators, but also a variety of competences. This paper reports on a multi-country study, which aimed at identifying the level of importance given to desired competences on sustainable development by teaching staff at a number of higher education institutions. On the basis of the findings, the paper identifies the gaps and outlines some of the needs which should be addressed, via which competence building may help to foster the educational and societal transformation towards sustainability. The implications of this paper are twofold. First, it emphasises the value of and the need for competences on sustainable development. Second, it illustrates some of the needs which should be met to provide a framework among which competences on sustainable development may be further developed.

Keywords Competences · University · Teaching staff · Sustainable development · Higher education

Introduction: teaching sustainable development at universities

Universities have been assuming the traditional role of being leaders and mentors in society (White 2015), adapting themselves to new contexts and needs. Built on the ultimate aim to 'transform our World' (UN 2015), the UN document Agenda 2030 clearly reconfirms "ambition to strive for holistic, integrated, interdisciplinary education" (Lovren 2017), calling for all education institutions, and in particular universities, to contribute to this complex transformative process. A difficult mission has been assigned to higher education institutions (HEIs) to prepare employable professionals for the knowledge-based economy and, at the same time, to educate reflective citizens, who would contribute towards ending poverty, injustice and environmental and climatic degradation in the world. As such, there has been a renewed focus on identifying needed competences, especially those related to teaching and education outcomes (Rieckmann and Gardiner 2015; Levesque and Blackstone 2020). Meeting these highly demanding tasks requires reorientation of existing structures within the university, as well as a redefinition of the role of students, teachers, and researchers (Steiner and Posch 2006). Further, universities need to develop sustainability-concerned citizens, not only through specific disciplines, but also in a general context approach, fostering learners to have impact in their personal and professional lives (Leal Filho et al. 2019a; Ruiz-Mallén and Heras 2020).

Bearing in mind the multidimensional process of education, teaching staff should not only support students in the "acquisition of competences that enable people to live and act in a sustainable way" (Dannenberg and Grapentin 2016, p. 8), but also develop their own sustainability competences. It is of special importance to support teaching staff in building education for sustainable development (ESD) competences, which are described as a "teacher's capacity to help people develop sustainability competencies through a range of innovative teaching and learning practices" (Rieckmann 2018, p.56). By 'teaching staff', we are referring to the educators of varying ranks

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