

Business Readiness Levels (BRLs) – A Classification Tool for Business Innovation Research

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Abstract

The principal objective of this paper is to introduce a concept of Business Readiness Levels (BRLs), supplementing Technology Readiness Levels (TRLs), to analyse business research and the progress an organisation has made in the business development process. In addition to the research challenges associated with TRLs phases, we aim to investigate in parallel the research, development and knowledge transfer activities associated with the maturity of business innovations, e.g. lean manufacturing. In doing so we may consider equivalent BRLs, which although not directly analogous to the TRLs, may be construed as the readiness of the business to take up innovation. We identify six sequential BRLs covering four transition phases that provide a structured methodology to classifying the level of maturity of a business innovation.

The BRLs tool provides a quantitative and qualitative method (e.g., interviews, focus groups and surveys) to determine the credibility and accountability of new business and also for analyzing the key risk factors that would provide an overview of the strengths and weaknesses of the business. It also helps determine which stage a business innovation is currently at and the kind of activity required to progress to a later stage. A complete narrative description of the successful deployment of research, development, and knowledge transfer and consultancy activities accompanies this assessment tool. This paper introduces a conceptual model and pertinent metrics of the Businesses Readiness Levels (BRLs) which may assist researchers, policy makers, entrepreneurs, and companies in determining the type of activity required to further exploit a particular business innovation.

Introduction

Companies who can successfully navigate the process of moving from new business concept development to commercialize products in the shortest amount of time, with the fewest number of miss steps and risks, and with an efficient use of resources are the ones most likely to succeed. Nowadays, entrepreneurs, SMEs as well as companies are often more challenged by business issues than technology and manufacturing issues. Technology and manufacturing readiness levels would not be achieved unless the technology under development can be commercialized as a self-sustaining business. Therefore the companies and entrepreneurs always seek a new research methodology to fulfil their expectations and enable them to expeditiously accelerate the commercialization. This paper intends to give companies and entrepreneurs a message of what attributes to consider when assessing the readiness of business.

To implement the businesses successfully, companies face challenges rooted in business

attributes and uncertainties, and demand new or improved managerial approaches. An advantage of small and medium sized companies is that they are usually more entrepreneurial and willing to experiment and innovate in terms of business models and operations than larger organizations with established hierarchies. The principal objective of this paper is to introduce a newly developed concept of Business Readiness Levels (BRLs), supplementing Technology Readiness Levels (TRLs) (Mankins, 1995), to analyse business research and the progress an organisation has made in the business development process. In addition to the research challenges associated with TRLs phases, we aim to investigate in parallel the research, development and knowledge transfer activities associated with the maturity of business innovations, e.g. lean manufacturing. In doing so we may consider equivalent BRLs, which although not directly analogous to the TRLs, may be construed as the readiness of the business to take up innovation. The BRLS tool provides a quantitative and qualitative method (e.g., interviews, focus groups and surveys) to determine the credibility and accountability of new business and also for analyzing the key risk factors that would provide an overview of the strengths and weaknesses of the business.

Development of the BRLs Classification Tool

There has been a great deal of work put into metrics and approaches to technology development and the maturity assessment in recent years. Some existing theories stress the technological development, such as Stage-Gate Game Plan (Cooper, 2001), while others concentrate on market evolution, such as the theory of Diffusion of Innovations (Rogers, 1995), Market Adoption Model (Moore, 1999), and Product/Service Lifecycle (Beacham, 2006). For assessing the maturity of generic technology and manufacturing systems several concepts and/or scales currently exist, for example, Technology Readiness Levels (TRLs), originally developed in the 1980s by the National Aeronautics and Space Administration and further adopted in the 1990s by the United States Air Force, and Manufacturing Readiness Levels (MRLs) as defined by the Department of Defense in 2005. The classification tool of BRLs proposed in this study was inspired by the TRLs scale which is composed of 9 levels grouped into 6 transition phases as shown in Figure 1. The MRLs provide a similar understanding of generic manufacturing risk and maturity, as illustrated in Figure 2, aiming how assessments fit into the defence acquisition process (Technology Readiness Assessment Desk book, 2005).

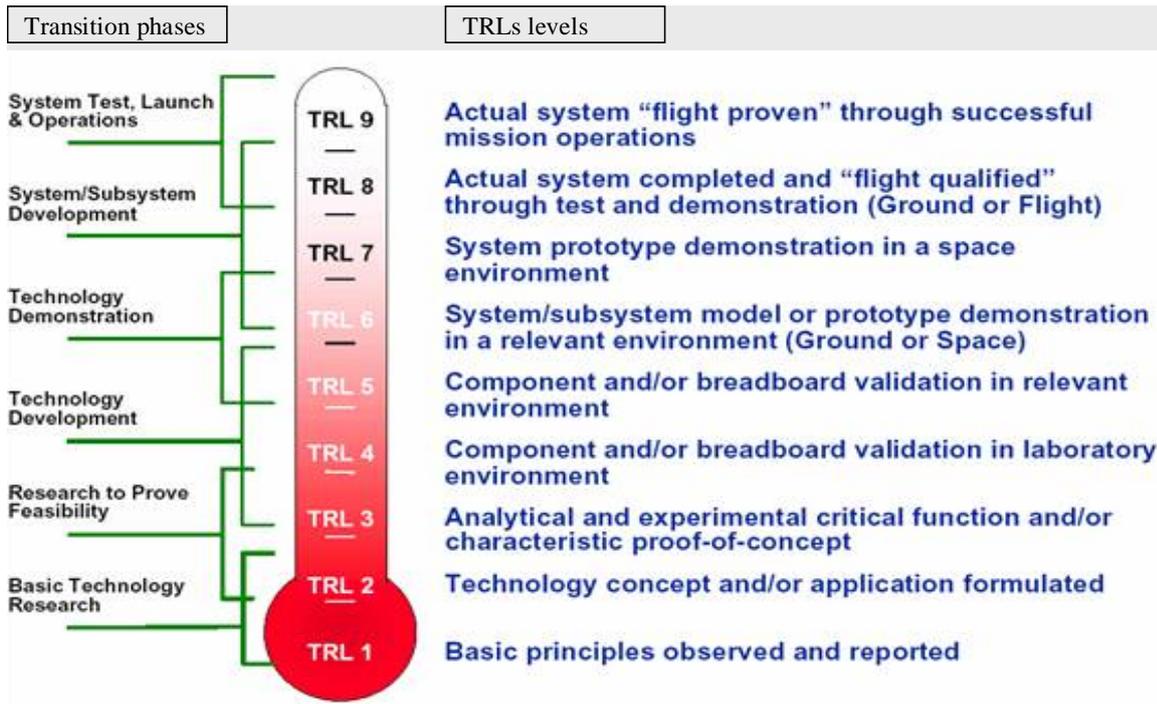


Figure 1: Technology Readiness Levels (TRLs) (adapted from NASA and Mankins 1995)

Manufacturing Readiness Levels	Definitions
MRL 1	Manufacturing Feasibility Assessed
MRL 2	Manufacturing Concepts Defined
MRL 3	Manufacturing Concepts Developed
MRL 4	Capability to produce the technology in a lab environment
MRL 5	Capability to produce prototype components in a production relevant environment
MRL 6	Capability to produce a prototype system/subsystem in a production relevant environment
MRL 7	Capability to produce systems, subsystems in a production representative environment
MRL 8	Pilot line capability demonstration. Ready for low-rate production
MRL 9	Low-rate production demonstration. Capability in place to begin full rate production
MRL 10	Full-rate production demonstration and lean production practices

Figure 2: Manufacturing Readiness Levels (MRLs) (adapted from DOD, 2005)

Although many different scales are common in industry, each criterion has a specialized nomenclature that varies based on the specific industry sector or organizational cluster. However, most organizations apply specific assessment scales to quantify the technology and manufacturing readiness of an unreleased technology and manufacturing process respectively. For a decade, the TRLs have become a tool that has added clarity to technical assessments and the discussion of technology maturity and risk especially for the defense acquisition process. The MRLs, like TRLs, represent a new and effective tool for the S&T and acquisition communities to address manufacturing risks. Over the years, the measurements of TRLs and MRLs have evolved into a structured approach with the goal of producing a quantitative value that accurately represents the maturity of the technology and manufacturing processes. However, the terminology and assessment method is specific and is strictly subjective as it relies on the questionnaires completed by experts, and time consuming to fill out the long lists of questionnaire.

Business readiness is the process of how one manage changes (both technological and business) that are common to every business such as new products, technologies and/or processes, new procedures and new ways of working that can affect the overall businesses. It helps to stay ahead of the change curve by proactively plan the steps that need to be taken to ensure that those areas of the business impacted by upcoming changes will be ready. As illustrated in Figure 3, the proposed BRLs matrix is a newly developed classification tool, supplementing TRLs and MRLs, to analyse business innovation research and the progress an organisation has made in their business development process. The key features of business innovation research are

- **Basic research** – covers case based fieldwork to observe, understand and document current ways of working in organisations and their supply chains.
- **Research to prove feasibility** – includes generation and testing of new generic business theories/concepts based on the outcomes and issues (both technological and business) identified through the basic research. Interviews, focus groups and/or surveys are used to determine the credibility and proof of concept of these new business concepts. Subsequent validation will be conducted via the use of industrial engineering tools (e.g. simulation) and field trialling.
- **Research for development and demonstration** – plan for development and demonstration of new business models to take place outside via new and established external routes, including the growing KTP programme.
- **Research to deployment** - business model qualification and take-up will be evidenced through the diffusion of the new ways of working within industry sectors.

Business Readiness Levels (BRLs)		Definitions
Transit Phase 1 (concept stage)	BRL 1	Understanding of Current Status of Business (observing and documenting current ways of working in organisations and their supply chains)
	BRL 2	Generation of New Generic Business Theories/Concepts (considering what is required to move the business from where it is to where it needs to be)
Transit Phase 2 (seed stage)	BRL 3	Testing of New Generic Business Theories/Concepts
Transit Phase 3 (early stage)	BRL 4	Validation of New Generic Business Models (field trialling)
Transit Phase 4 (mid stage)	BRL 5	Demonstration of New Generic Business Models (observing the progress on business readiness targets)
Transit Phase 5 (late stage)	BRL 6	Deployment of New Generic Business Models (qualification and take-up: diffusion of the new ways of working within industry sectors)

Figure 3: The proposed matrix of Business Readiness Levels (BRLs)

Defining the Levels or Phases of BRLs

- BRL1: Understanding of Current Status of Business** (observing and documenting current ways of working in organisations and their supply chains)

Components:

- Understand overall business strategy
- Know the action plan (e.g. organisation structures and operations trajectory) and investments (e.g. costs, materials and information flow, cash flow)
- Human resource infrastructures (e.g. staffing arrangement)
- Communications and access (e.g. external and internal inputs, partnership and/or collaboration)

- BRL2: Generation of New Generic Business Theories/Concepts** (considering what is required to move the business from where it is to where it needs to be)

Components:

- Commissioning robust new business plans/concepts including a time horizon and introduction of new business models (speculative, no practical proof)
- Profiling new pricing/investment models
- Formulation of new marketing and sales methods
- Construction of new supply chain models/infrastructures

- BRL3: Testing of New Generic Business Theories/Concepts**

Components:

- Research undertaken to prove feasibility of new business models
- Experimental proof of key parameters
- Testing the scalability and accountability in real use
- Performance testing and benchmark reports

- BRL4: Validation of New Generic Business Models** (field trialling)

Components:

- Any of a series of units built to validate and evaluate new generic business (field trialling). Industrial engineering tools to help fine-tune the components for performance measure
 - Use new business models including key parameters
 - Troubleshooting and accreditation
5. ***BRL5: Demonstration of New Generic Business*** (observing the progress on business readiness targets)
- Components:***
- Business engagement activities
 - Training design and development activities
 - Demonstration of key operational metrics
6. ***BRL6: Deployment of New Generic Business Models*** (qualification and take-up: diffusion of the new ways of working within industry sectors)
- Components:***
- Establish and/or create new business readiness climate to take up innovation qualification of new business models including key parameters and return to productivity measures
 - Transformation and turn-around

Defining the Transition Phases of BRLs

Transition Phase 1 (concept stage, transition from BRL 1 to BRL 2):

- Conducting an assessment of potential business needs based on current business components and opportunities. Requires adequate modifications of current business within existing experiences

Transition Phase 2 (seed stage, transition from BRL 2 to BRL 3):

- Requires new business plans/concepts identifying new business models to be developed, alternate paths including key components to be pursued

Transition Phase 3 (early stage, transition from BRL 3 to BRL 4):

- Accountability of new business models demonstrating that all components have achieved a level of business research (initial production, product but no revenue)

Transition Phase 4 (mid stage, transition from BRL 4 to BRL 5):

- Demonstrated key operational metrics of business readiness targets (full production, product but revenue)

Transition Phase 5 (late stage, transition from BRL 5 to BRL 6):

- Demonstrated evidence of qualification and diffusion within industry sectors (full production, growing market share)

The purpose of developing this classification tool is to provide decision-makers a common understanding of what systems the business has and determine the areas of weaknesses and develop templates to help the business reach a worthy standard. It helps understand the concepts of business valuation and explore possible best outcome deal structures and modeling the methodology of assessment. A basic comparison between the technology, manufacturing and business readiness levels is shown in Figure 4. The BRLs classification tool will seek to optimise the transit of business through the initial stages of their development by engaging key stakeholders, business organisations, technology providers and end-users early on in the creation of new production and business platforms, and value chains. In addition to the business challenges associated with each of the BRLs, this tool will investigate in parallel how companies organise internally and how they interact with others in their extended enterprise for successfully exploiting their businesses.

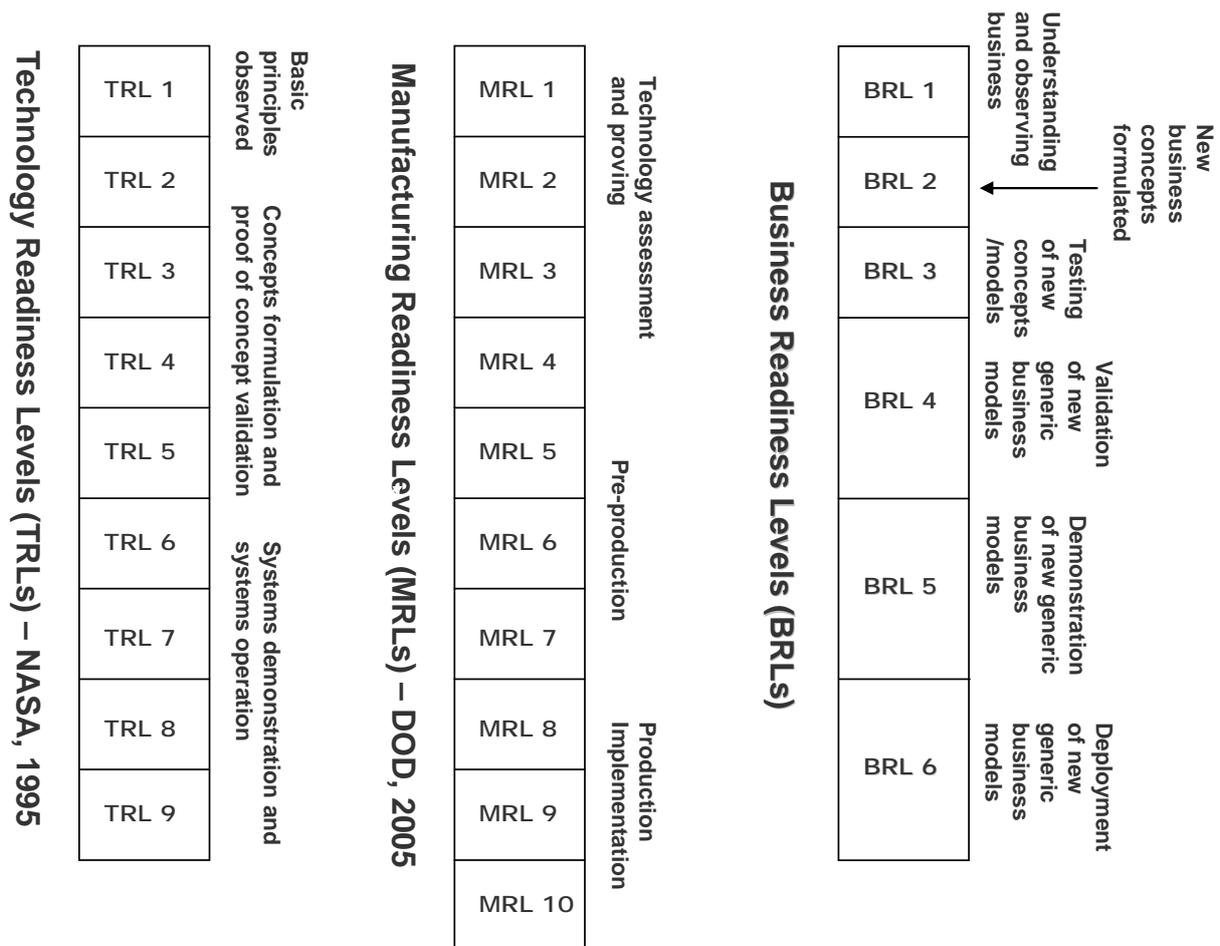


Figure 4: A basic comparison of readiness levels

Discussions

This paper has reported the concept of BRLs to provide a generic outline for business managers to position themselves and take into account the key elements of business innovation research. In general the proposed BRLs are a descriptive assessment tool rather than a prescriptive one. Our goal in proposing the BRLs is to offer an open framework for business evaluation. When it is to be used in a particular business sector, the BRLs could be adapted to suit that situation. This classification tool aims to accelerate the business assessment process with a systematic approach, facilitate the exchange of information between business managers and increase confidence in high quality and successful business. As the BRLs conceptual model is open and customizable, it can be applied to any business situation by adapting some of the assessment criteria from different companies and organizations to perform their own evaluations. This method can be widely used by organizations focused on technology-based economic development and can assist new start up and existing companies in developing their commercialization strategies for new products. It is also expected to apply as a tool to enable companies to assess their business innovation practices.

A complete narrative description of the successful deployment of new business process accompanies this tool, which would assist entrepreneurs, SMEs and existing companies in strategizing their commercialization plans. The BRLs classification tool could be of use in 1) identifying the entrepreneurs, SMEs as well as companies progress in the commercialization

process; 2) assisting in developing a go-forward business and/or commercialization strategy; 3) identifying appropriate needs of successful exploitation of businesses. The tool also provides a quantitative and qualitative method (e.g., interviews, focus groups and surveys) to determine the credibility and proof of concept of new business and for analyzing key risk factors that would provide an overview of the strengths and weaknesses of the business.

As the aim of this paper is exploratory and conceptual, the practicability and applicability of the classification tool of BRLs is underway through case studies and focus group studies. The proposed usage of BRLs concept is yet to be tested and consolidated in order to better understand its application and impacts. The focus group and case studies combining with online questionnaire survey will confirm the feasibility of BRLs and help building the generic model which would be used as a management tool for actors in a range of business sectors. Further attempts are taken to conduct online questionnaire survey with companies, entrepreneurs and SMEs in various sectors, in order to increase its widespread adoption and to refine the BRLs conceptual model.

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