PERFORMANCE BASED BUILDING

Full Paper

STAKEHOLDER ENGAGEMENT IN THE PERFORMANCE APPROACH – THE AUSTRALIAN AND EUROPEAN PERFORMANCE BASED BUILDING NETWORKS

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ABSTRACT

The Performance Based Building (PeBBu) Networks in Europe and Australia have provided an unprecedented opportunity to engage a wide variety of industry stakeholders (on both "supply" and "demand" sides) in advancing the application of the performance approach in building and construction. This paper presents the background development, activities and accomplishments of these Networks. Much has been achieved, even in a short period, and these achievements and those they spawn will likely have lasting contributions and impact beyond Europe, and well beyond the formal period of PeBBu activity and funding. We also identify the primary challenges in practical application and implementation of the performance approach. To effectively engage stakeholders and increase the rate of adoption, the dominant need seems to be clear communication of the meaning, application and benefits of the performance approach, with emphasis on actual benefits and value – that is, a compelling value proposition is more important than technical achievements.

Keywords: performance approach, performance concept, stakeholder engagement, technology diffusion, EU Fifth Framework Programme

INTRODUCTION

The performance concept in building and construction had been practiced in some measure, and in very specific situations, even before it came to be formally known as "the performance approach". The earliest, and most often repeated, example is the requirement that a house should not collapse and kill anybody in the Hammurabi Code (circa 1950 to 1910 BC). The concept is also reflected in the early architectural philosophy of the Romans, as described in Vitruvius's (1960) landmark "*The Ten Books of Architecture*".

Developments in the last century have led to a clearer description of what it means in both concept and practice, and what its potential, benefits and challenges are (Foliente 2000). These developments can be traced through the reports from the US National Bureau of Standards (1925, 1977), the proceedings of the series of joint CIB-ASTM-RILEM conferences on the Performance Concept in Buildings that were held in Philadelphia, USA (Foster 1972a, 1972b), Lisbon, Portugal (LNEC 1982a, 1982b), and Tel Aviv, Israel (Becker and Paciuk 1996a, 1996b) (with ISO as a co-sponsor of the Tel Aviv conference), and various CIB publications (CIB 1982, 1988, 1989, 1993, 1997).

But despite significant progress in some applications such as building regulations (IRCC 1998) and engineering design (BRI 1997, SFPE 1996, 1998, 2000), performance based building has not been applied in its entirety (Becker 1999) – i.e. across performance attributes and systematically throughout the project delivery process – and has not been adopted more widely in the industry. Thus, its full potential and promised benefits remain unrealised. There are technical and non-technical reasons for this (Becker 1999, IRCC 1998). Included in the latter is the lack of committed engagement by critical stakeholders in the full implementation of the performance approach.

In order to progress the technical developments in, and the practical implementation of, performance based building, the CIB Board and Program Committee initiated the Proactive Program on Performance Based Building in the 1998-2001 triennium (Foliente et al. 1998, Foliente 1998). Then with funding from the European Union (EU) Fifth Framework Programme, this was followed by the establishment of the Performance Based Building (PeBBu) Thematic Network, running from October 2001 to September 2005. In 2003, the Australian Performance Based Building (Aus-PeBBu) Network was also established, with funding from an Australian government department, industry partners and the CSIRO, to promote the concept in Australia and to facilitate linkages and exchange of information between the EU-PeBBu Programme/Network and the Aus-PeBBu Network.

Both EU-PeBBu and Aus-PeBBu have provided an unprecedented opportunity to engage a wide variety of stakeholders in moving towards widespread application of the performance approach in building and construction. This paper presents the activities and accomplishments of these Networks, and identifies future development and implementation needs.

KEY STAKEHOLDERS IN THE PERFORMANCE APPROACH

In broad terms, the performance approach is the practice of thinking and working in terms of ends rather than means (CIB 1982). The "ends" usually relate to technical

attributes of a building, whether expressed as a high-level goal (e.g. safety), functional requirement (e.g. structural stability) or specific performance requirement (e.g. the load-carrying capacity of a column should be greater than the vertical load it supports).

Performance based building spans the whole life of the building. It is applicable to cover different levels of the physical elements of a building (from performance of individual products or elements to performance of the whole building) and can accommodate a large set of attributes (limited only by what we can think of). It naturally affects everyone involved in the delivery and management of built assets. The list of important stakeholders include (asterisks indicate relative level of importance in hastening and widening the adoption of the concept):

• Policy makers* • Regulators** (planning, building & occupational health & safety, etc) • Building officials • Investors and financiers** • Developers** • Owners and owner-occupiers** • Architects & designers* • Engineering professionals* • Specialist consultants	• Product manufacturers* • Project managers • Builders/contractors & sub-contractors* • Facilities managers (FM)* • Service providers to FM • Owners, users/tenants** • Software/IT professionals • Researchers* • Teachers/educators*

Since the performance approach is focused on meeting the needs and requirements of those that procure the building and/or will eventually use the building (i.e. the “demand” side), their engagement is considered very critical. And their level of importance is reflected in the list above with double asterisks.

Planning, building and occupational safety regulations specify minimum requirements. When these requirements are given in performance terms, innovative or cost-effective solutions are possible. Building regulations aim to eliminate worst practice and protect building users and owners, and the community. Because of their legal status, in most countries, they can have significant influence in the industry and national economy.

The client/demand side has to know what can be asked beyond minimum requirements, be able to identify their desired building attributes, and communicate these to those who will deliver them (i.e. the “supply” side). The latter needs to be able to translate these attributes into functional or performance requirements. When progressive clients set requirements above and beyond those required in the building code or by regulations, they encourage and promote best practice.

Classification of stakeholders as demand and supply sides is a convenient simplification. In reality, however, the industry cannot be so easily categorised as consisting of these two sides. Some stakeholders, in some instances, can be on both sides (e.g. a developer), and in other instances be on either side. Since the performance approach is mostly about fulfilling the desired “ends” of the demand side, any project that involves educated and innovative stakeholders on the demand side and well-equipped stakeholders on the supply side have a much higher possibility of success.

Researchers and teachers (of tertiary/professional and trade/technical students), who do not fit nicely into the demand and supply classifications, also play crucial roles in advancing knowledge and understanding, developing tools and methods, and educating and equipping the other stakeholders.

THE PeBBu NETWORKS

The main objective of the EU-PeBBu Network is to actively facilitate knowledge dissemination and practical implementation of the performance approach in building and construction practice worldwide. The EU-PeBBu activities were aimed at maximising the contributions to this effort by the international research and development (R&D) community. With the CIB Development Foundation (CIBdf) running the secretariat and programme coordination and management, the natural starting point for stakeholder engagement is the CIB membership and network. The following stakeholder groups are, therefore, well represented in the PeBBu network: R&D agencies, universities, progressive companies and consultants, regulatory and standardisation bodies, and professional organisations and associations.

COMPONENTS OF EU-PeBBu

The current PeBBu programme[1] is presented in Figure 1b. It includes the following "core" components:

- International programming/coordination of research within **6 Scientific Domains**
- Involvement of target groups/stakeholders through **3 User Platforms:** (a) Buildings Owners, Users and Managers, (b) Building and Construction Industry, and (c) International Standardisation and Conformity Community
- **4 Regional Platforms** in Europe to act as the bridge to and the initiator of aligned national activities (Northern, West/Central, East and Mediterranean)
- **Network Management** - through a Network Steering Committee, a Technical Committee and a Network Secretariat
- **Mapping of national and international research** related to various aspects of Performance Based Building.

At the onset of PeBBu, the programme had 9 scientific domains (Figure 1a). These spanned across the various themes and aspects of performance based building. Midway through the project, three of these domains ("Built Environment", "Organisation & Management" and "Information & Documentation") were terminated because the scope of these domains was too vast, research was slow or inactive, and/or they overlapped with other domain topics.

Some other relevant topics arose and were developed as new tasks to replace the terminated domains. These are:

1. Performance based building & the EU Construction Products Directive (CPD)
2. Decision making tool-kit for performance based building
3. Sustainability indicators for performance based building.

In addition to the core components, various aligned activities in support of PeBBu have been in operation (Figure 1b). They contribute significantly to the PeBBu Network, but are not directly funded from the EU-PeBBu budget.

[1] More detailed information on the PeBBu Network, its program of activities and its organisation can be found in the PeBBu website http://www.pebbu.nl

KEY ACCOMPLISHMENTS OF EU-PeBBu TO DATE

The PeBBu Network has made considerable progress in its few years of operation. Some of the main achievements to June 2004 include:

- **Expansion of the Network through the Newly Associated States (NAS) and observer-members.** Several Eastern European countries have been added to the Network as Newly Associated States (NAS) and 13 new organisations from these countries are now members of the PeBBu Network. In addition, several observer-members, from non-EU countries, have become a part of the Network.
- **Establishment of aligned activities such as the PeBBu Compendia**. The Compendium of Performance Based Building Models includes database that at present includes more than 30 different models. The Compendium of Statements of Requirements aims for the development of a consensus derived performance based building conceptual framework and key terminology.
- **Production of 9 scientific domain reports**, which summarise the main content-based work and results emanating from the domain work and workshops along with 9 international R&D agendas.
- **Production of the International State of the Art (SotA) Report**, which gives an overview of the status of performance based building in an international context. The International SotA analyses the spread of performance based building principles through many National SotA reports from the European context, and reviews the use of these principles in other parts of the world. The International SotA has been published as a CIB special publication (2003). An East European SotA Report has also been produced.
- **Establishment of many strategic relationships**. Examples of these are:
  - The relationship between PeBBu Domain 1 and ISO, which has influenced the writing of standards related to the durability of construction materials and components;
  - Co-operation with ISO TAG8 (the ISO Technical Advisory Group that is responsible for building related standards) on a multi-year programme within ISO that aims for the production of performance based standards that are to replace or to be added to the current prescriptive ones;
  - Other strategic relationships including PeBBu and aligned activities have influenced new work in the Indoor Environment area;
  - The relationship that PeBBu has established with the E-CORE projects where performance based building will be one of the main building blocks in a future European Research and Development (R&D) strategy.
  - Co-operation with the Liaison Committee of International Associations of Civil Engineering aiming for the establishment of a joint committee on Performance Based Building and Pre-Standardization in Civil Engineering.
- **Moving towards a consensus on language, concepts and issues**. This is mainly a result of the performance based building compendium on Statement of Requirements.
- **Involvement with/and support of several CIB Commissions**. This aspect has been further detailed at a later stage in this paper.

THE AUS-PeBBu NETWORK

An Australian version of the PeBBu Network (or Aus-PeBBu)[2] was launched in October 2003. With one exception, its program matches the revised scientific domain themes in EU-PeBBu, to provide one-to-one correspondence of efforts and to maximise opportunity for participants in both Networks to discuss similar topics and issues and to cooperate on matters of mutual interest.

The main difference in the program is the inclusion in Aus-PeBBu of a domain "Sustainable Built Environment". With significant national and international interests, initiatives and investments in sustainable development, this topic provides a great opportunity to introduce the performance approach to a sector of the industry that is progressive, innovative and growing fast. With much dependence on the current use of environmental or "green" rating and assessment tools, and the promotion of demonstration projects, there are indicators that many are implicitly adopting a prescriptive approach.

Australia is one of the leaders in the move from a more prescriptive to a more performance based building code and is actively involved in international and national developments in this area. [The Australian Building Codes Board is involved, for example, with the Inter-jurisdictional Regulatory Collaboration Committee (IRCC)[3] and Aus-PeBBu.] But with less funding and much smaller scope than the EU programme, Aus-PeBBu has a relatively stronger focus on facilitating the proactive application of the performance approach through best practice project delivery processes. It aims to contribute to the following areas of long-term development:

1. Establishment of a basic framework (including performance indicators) and clarification of terms and definitions;
2. Establishment of (multi-level) performance criteria for attributes that do not yet have these;
3. Development and publication of a guide on methods of establishing/setting performance; and
4. Expansion and maintenance of the database compendium of performance models, tools or methods that can be used to achieve targets (e.g. during design), and to assess/verify/evaluate performance in-service.

Lack of understanding, relevant information and appropriate tools/methods on the topics listed above hinder the practical implementation of the performance approach.

While addressing these four focus areas assist both the demand and supply sides, the degree of assistance will tend to favour the supply side. To encourage the stakeholders in the demand side, we need to establish the benefits and value of the performance approach. This has previously been identified as a priority area in the CIB's Proactive Programme on Performance Based Building from 1998-2001 (Foliente 1998) and a CIB report has identified opportunities and challenges (Tempelmans Plat and Hermans 2001). Aus-PeBBu will also initiate a collection of case studies of projects relevant to Australia where the performance approach has been used before and where benefits have been gained.

[2] More detailed information on the Aus- PeBBu Network can be found in http://www.auspebbu.org

[3] IRCC is an unaffiliated committee of ten of the leading building regulatory agencies from eight countries; see http://www.ircc.gov.au/ for further details.

The last area of difference between Aus-PeBBu and EU-PeBBu is the participation of different stakeholders (both demand and supply sides) within each domain in Aus-PeBBu; i.e. there are no separate user platforms. Anyone interested in the technical domains can participate; demand side representatives are actively sought. Communication and social integration of stakeholders are encouraged.

IMPLEMENTATION NEEDS & CHALLENGES

STAKEHOLDER ENGAGEMENT

Within corporate and government client organisations, project decision-makers are often unaware of the concept, application and benefits of the performance approach. Our experiences with the PeBBu Networks confirm that the key to hastening and widening the adoption and implementation of performance based building within a country or region is actively engaging, and then motivating in a sustained way, critical industry stakeholders, especially those on the demand side. Even among these stakeholder groups, we need to identify the key opinion leaders, innovators, connectors and early adopters that can show the way in practical applications, benefit from it and help communicate to others the value of the performance concept. When the "early majority" adopt the approach (Figure 2), reaching an industry tipping point is more likely (Gladwell 2000; Foliente and Boxhall 2002). This is, therefore, one of the big challenges: identifying and demonstrating the value and benefits to these stakeholder groups. This also links the performance based building programme with the CIB proactive programme on Revaluing Construction.

In the international arena, although there is a growing interest in performance based building applications, both concept and language difficulties pose a major barrier to stakeholder engagement. There is fragmentation and divergence in understanding the concept and applications. Many factors affect this issue (Foliente et al. 1998).

In summary, the dominant need in stakeholder engagement seems to be clear communication of meaning, application and benefits of the performance approach, with emphasis on benefits and value. In other words, technical issues should give way to a compelling value proposition.

TECHNICAL CHALLENGES

The broad technical challenges in performance based building have been previously identified in Foliente et al. (1998), IRCC (1998), Becker (1999) and Foliente (2000). The primary technical challenges include the following:

1. *Establishing target performance or outcomes* including objectives, functional attributes and performance requirements – beyond what are covered by building codes – as part of a project brief is currently seen as very onerous, if not very difficult. Both large repeat "clients" and one-time or occasional "clients" would benefit from a broad framework of requirements, which can serve as a checklist or reminder of performance outcomes to consider, and a set of guidelines on how to set these outcomes or targets.
2. *The right tools or methods* to design or deliver solutions to meet target performance or outcomes, *and* to assess/evaluate whether a given design or solution meet these targets need to be provided. The CIB initiative on developing a Compendium of Building Models and Tools (which can be accessed through the Aus-PeBBu website) was an initial attempt to collect and provide a central database of these tools that can be accessed by anyone anywhere. But until this

develops into a critical mass, and tool developers submit information and stakeholders access the information on a routine basis, it will have limited impact. There are a few areas of performance that have lots of tools and there are many that have no available tools. Where tools are available, appropriate guidelines on use, scope and limitations are required. The applicability of some tools is very specific to a country or local environment.

3. *The extent of development and depth of knowledge are very uneven* across technical/functional topics (e.g. structural performance vs. indoor environment; fire safety performance vs. sustainability, etc). Multiple levels of quantified performance criteria are possible in one area but only a qualitative statement of requirements is possible in another area. Design tools and methods are available for one but not for another.
4. *The inter-relationship of performance attributes is not always well established or understood,* and requires much further research and development. This inhibits optimum design, considering system performance where competing requirements need to be considered (e.g. structural safety vs fire safety vs sustainability/service life).

IMPLEMENTATION AND APPLICATION

In regulatory applications, the IRCC has done much in sharing knowledge and experiences in the development and implementation of performance-based building codes in developed countries with strong legal and technological foundations. Other developed countries can obtain much potentially useful information from IRCC reports and publications. But other countries, especially the developing countries, need further materials and guidance on how to implement the performance concept in their own building codes. It is not appropriate for these countries to directly adopt those published in, and for, developed countries. Depending on many local factors – such as original content of building codes, legal status of, and degree of compliance to, local building codes, building approval process, degree of development and practice of quality control, certification and assurance (at both product and building levels), extent of involvement of professionals, etc – the appropriate mix of performance-based and prescriptive provisions in the code will differ. In other words, the entry point into the pathway of performance based building code development will be different for different countries or groups of countries. Guidelines to assist regulatory bodies in these countries will be helpful.

In trade applications, there is still much industry confusion on both requirements and processes for acceptance of products or methods from one country to another, even in a country where a performance-based building code is already in operation. Within Europe, the introduction and implementation of the CPD require supporting documents or guidelines. EU-PeBBu has initiated a new task to provide further practical explanations of what CPD means in the context of performance-based trade. In other countries where local building regulations and standards are unclear about required performance, ISO standards are sometimes accepted. Thus, ISO standards need to be consistently framed in performance terms.

In encouraging best practice in building procurement and production process, there is need for a facilitating platform (Becker 1999) and/or successful example(s) where the performance concept can be or has been used in its entirety from project definition to handover/commissioning and in-service/occupancy stage, and with as wide a set of performance attributes as possible. The process or successful example(s) should be

fully documented to serve as a guide for others to try the *full* application of the performance approach in their projects.

CONCLUDING COMMENTS

The PeBBu Networks have kick-started a range of activities, not only in Europe, but also in other parts of the world that contribute to the engagement of industry stakeholders, the sharing of knowledge and experiences, trade facilitation, establishment of worldwide networks of agencies and professionals, and further development of performance based building. Much has been achieved even in a short period, and these achievements and those they spawn will be likely to have lasting contributions and impact beyond Europe, and well beyond the formal period of PeBBu activity and funding.

To effectively engage stakeholders and increase the rate of adoption of the performance approach, the dominant need seems to be clear communication of the meaning, application and benefits of the performance approach, with emphasis on actual benefits and value. Thus, priority effort is required to: (1) determine the value and benefits of performance based building for different stakeholder groups, underpinned with actual case studies, and (2) package them for a compelling presentation to these stakeholders. This will facilitate client- or demand-driven innovation, made possible by the performance approach.

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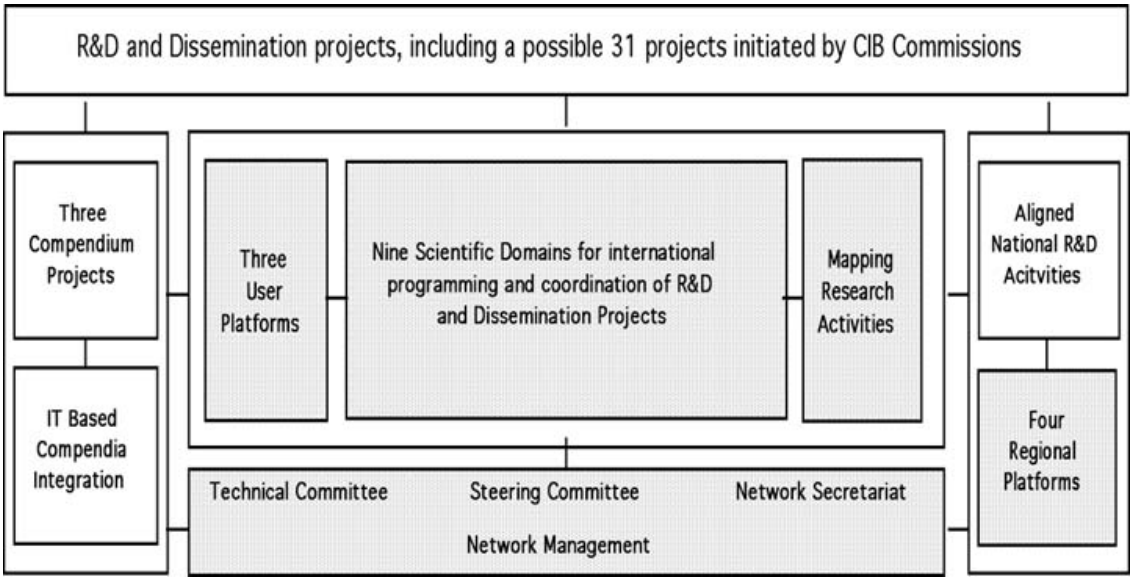
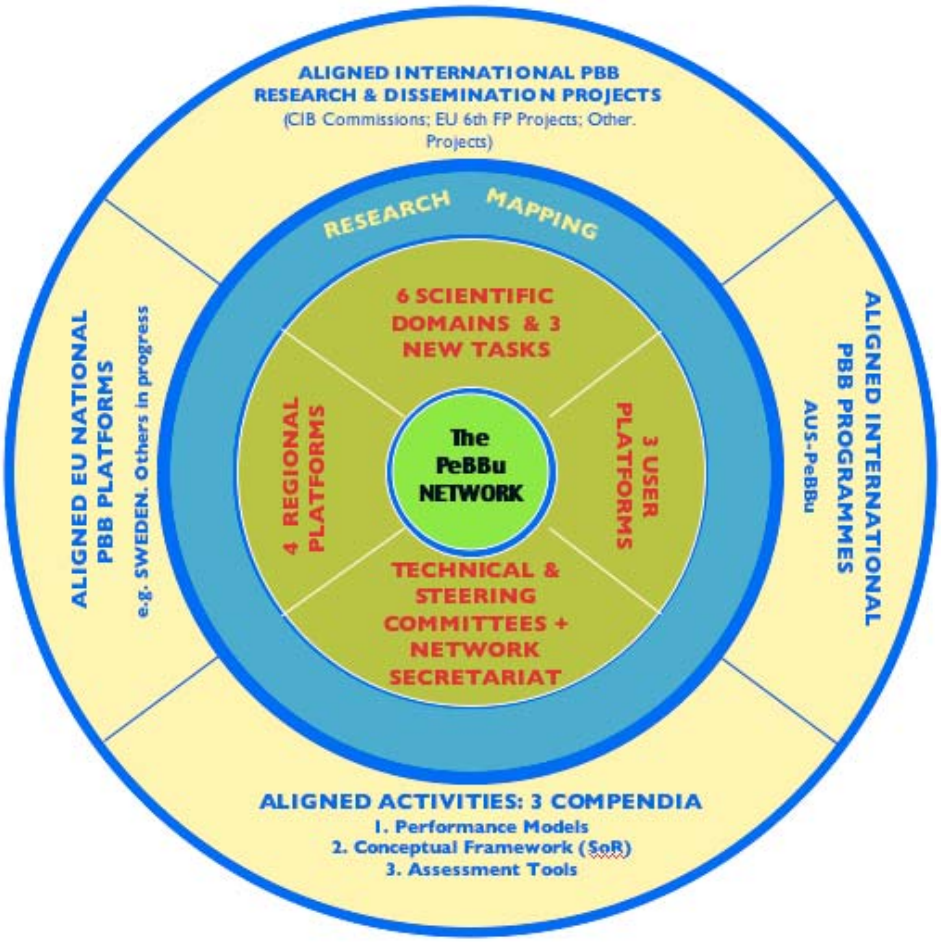


(a) Original Programme



(b) Revised Programme

Figure 1. The EU-PeBBu Programme

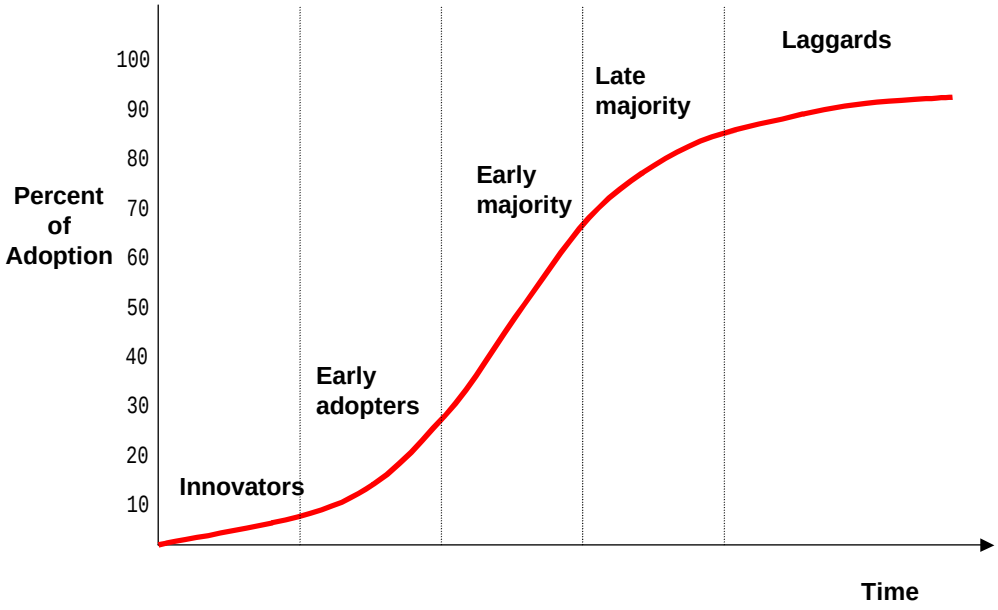


Figure 2. Adopter types in the diffusion process (Smale 1996)