

# **Building and sustaining national ICT/education agencies:**

## ***Lessons from Indonesia (PUSTEKKOM)***

*World Bank Education, Technology & Innovation:  
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## Executive summary

This case study explores the establishment and changing role of Pustekkom, the Centre for Information and Communication Technology for Education, which is part of the Ministry of Education and Culture in Indonesia. Originally established as a content development house, with a focus on audio/radio and video/film/television content, Pustekkom is currently grappling with a requirement to change its role, given a new mandate that it has been given to plan and provide ICT infrastructure, services, professional development and resources to schools. Thus, this case study explores the challenges facing Pustekkom, as well as how it is responding to a common challenge facing education systems around the world: How do well established systems and organizations that have operated on a relatively stable set of assumptions for many years cope with the institutional transformation that is being forced on them as growing ICT penetration within societies challenges traditional ways of operating and disrupts entrenched power structures in education? This exploration of a national ICT in education agency with a transforming mandate yields some key lessons of potential relevance globally.



## 1. Introduction: Continuity and Change

Established in 1978, the mandate of Pustekkom, the Centre for Information and Communication Technology for Education (*Pusat Teknologi Informasi dan Komunikasi untuk Pendidikan*) was that of a content development house. Since its inception, Pustekkom has played a significant role in producing educational materials for the Indonesian education system, originally with a focus on audio/radio and video/film/television content, but more recently also with an expanded focus on computer-based multimedia. This content development function has been a very important one throughout the history of Pustekkom, because the formal language of instruction in Indonesian schools, *Bahasa Indonesia*, is not spoken in any other countries, so indigenous content development takes on particular importance in the country.

Like so many other educational support agencies whose existence pre-dates the relatively recent explosive development of Information and Communication Technologies (ICT), Pustekkom has had to grapple with a changing mandate and an accompanying need to reconfigure itself to implement this mandate effectively. The Government of Indonesia has recognized the potential benefits of ICT in education and committed substantial financial resources to bring ICT into schools. The National ICT Council (*Detiknas*) was formed in 2006, with ICT in education (or e-Education) as a national flagship project and the Ministry of Education and Culture (MoEC) identified as the government agency responsible for implementation. As a consequence of this, within MoEC, Pustekkom was relatively recently appointed to plan and provide ICT infrastructure, services, professional development and resources to schools. In 2008, Pustekkom was handed formal responsibility for the ICT and education arena in Indonesia. This mandate was given based on Ministerial Regulation #38 of that year as an enhanced function of its role established by MoEC in 2005.

Thus, while Pustekkom continues to run several more traditional content development activities and maintains various broadcasting services for Indonesia, it is simultaneously undergoing a significant process of change that reflect the growing importance of ICT in education. This change is both exciting and daunting. On the one hand, it creates opportunities to offer innovative and potentially transformative new educational services to the schooling systems in Indonesia. On the other, it requires new functions and different kinds of expertise, demands a shift in mindset from 'content production' to 'e-service delivery', and generates political challenges as changing mandates lead to some uncertainty about where responsibility for different functions lies within the overall structures of the MoEC. Although many of these challenges are unique to Indonesia and Pustekkom, they do reflect a common underlying challenge facing education systems all around the world: How do well established systems and organizations that have operated on a relatively stable set of assumptions for many years cope with the institutional transformation that is being forced on them as growing ICT penetration within societies challenges traditional ways of operating and disrupts entrenched power structures in education?

## 2. The Policy Challenge: Defining and Securing a New Mandate

From a policy perspective, Indonesia's commitment to greater integration of ICT into education is clearly defined. Strategic and system-wide use of ICT in Indonesian education is considered integral to achieving the MoEC's overall educational objectives as outlined in the *2010-2014 MoNE Strategic Plan (Renstra): Strategy and direction of national education development policy year 2010-2014*. Use of ICT is believed to support efforts to increase and equalize access to education, improved quality, relevance, and education competitiveness, along with management, accountability, and public image toward education. The MoEC believes that application of ICT for education can expand the affordability of education and strengthen governance at the same time.

However, according to the *2010-2014 MoNE Strategic Plan*,<sup>1</sup> 'there still exist ICT literacy gaps between the regions on one side and the development of the internet that also brought negative impact on values and norms of society and provided opportunities of plagiarism and IPR violations on the other side'.<sup>2</sup> Consequently, the MoEC defined the following key activities in its current Strategic Plan:

- 1) The provision of ICT infrastructure and facilities and ICT-based learning content for the strengthening and expansion of e-learning at all levels of education.
- 2) Development of e-management, e-reporting, and e-services to enhance the effectiveness of governance and public service.
- 3) Development of knowledge management systems to facilitate the sharing of information and knowledge among learners and educators.
- 4) Development of ICT-based learning resource centres in elementary and secondary education.
- 5) Increasing human resource capacity to support the efficient use of ICT in the central and local level.<sup>3</sup>

Much of the responsibility for overseeing these activities was given to Pustekkom in 2008. Despite this, however, there is an ongoing requirement to determine clear authority for this shift in Pustekkom's mandate. Activities across all five of the above broad areas can be found in several Directorates within the MoEC. For example, the Directorate of Development for Primary Schools was, until 2011, provision of block grants to Junior Secondary schools to purchase computer laboratories (with a budget to distribute 15,000 such grants in 2011), and a similar, smaller-scale initiative at primary level coordinated through the Directorate of Development of Junior Secondary Schools. In 2012, the financial resources for these activities have subsequently been shifted into the country's schools rehabilitation programme. Likewise, a recent audit conducted by Pustekkom of the MoEC web presence has identified around numerous unique websites and online services.

Compounding this, many activities are also implemented, often without direct central coordination, at both the provincial and district levels of the country. Indonesia has one of the world's most decentralized education systems, a situation magnified by the sheer size and complexity of the country. With over '50 million students and 2.6 million teachers in more than

<sup>1</sup> Chapter I of the 2010 - 2014 MoNE Strategic Plan (Renstra): "Strategy and direction of national education development policy year 2010-2014".

<sup>2</sup> Chapter IV of the 2010 - 2014 MoNE Strategic Plan (Renstra): "Strategy and direction of national education development policy year 2010-2014".

<sup>3</sup> *ibid.*

250,000 schools<sup>4</sup>, Indonesia is the third largest education system in the Asia region and the fourth largest in the world (behind only China, India, and the United States of America). The scale, distribution and diversity of the Indonesian archipelago, with over 17,000 islands, poses challenges in managing and delivering support to schools in places that are minimally served by transportation, electricity, and communication.

Within this context, a Decentralization Law was issued, based on Indonesian Law # 22 year 1999, which grants decentralized power to 497 districts and municipalities.<sup>5</sup> This authorizes districts (or *kabupaten*) and municipalities (or *kota*) to govern, to plan development programmes according to local needs, and to decide on financial budgeting and expenditure based on proportions determined at a national level. Within this framework of decentralization, Indonesia's 33 provinces implement tasks in the provinces as the central government's representatives.

Consequently, Pustekkom is required to operate across a wide-ranging and complex political terrain, involving many different players with varying and sometimes overlapping responsibilities. While there is great merit in the importance of securing buy-in to new initiatives, as Pustekkom is currently required to do, the parallel reality is that innovative and often disruptive effects of ICT in broader Indonesian society are being felt much faster than this political process is facilitating adjustment by both Pustekkom and the wider educational system of which it is part. This is a challenging situation to confront, not only for the Indonesian education system but indeed globally. Key to successful integration of ICT into education for Pustekkom will be to shift planning and implementation away from seeing ICT as an add-on to education systems that function largely as they have for many years towards developing e-services that are driven by ICT and that enable the education system to harness the full potential productivity and efficiency gains offered by technology.

Given these realities, the first key challenge for Pustekkom is to secure clear political commitment to implement its new mandate in ICT in education. As the above examples illustrate, this is a long process requiring engagement with, and buy-in from, a wide range of stakeholders. This challenge is compounded by Pustekkom's historical role, as many people and organizations associate it so strongly with these historical roles that they tend to pigeon-hole the agency as a content developer. Unfortunately, the current Ministerial Regulation does not supply sufficient direction on the precise role expected of Pustekkom and its relationship to other structures within the MoEC, at national, provincial and district levels. Because of this – during 2012 – Pustekkom will be leading a process of developing a refinement of the current Ministerial Regulation No. 38/2008 regarding ICT Management within the MoEC. The objective of this will be to establish a clear legal mechanism for Pustekkom to pursue its expanded mandate. Hopefully, this will provide a clear and strong policy platform from which the agency can effectively coordinate ICT in education investments in the Indonesia.

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<sup>4</sup><http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/INDONESIA/AEXTN/0,,contentMDK:21521167~pagePK:141137~piPK:141127~theSitePK:226309,00.html>

<sup>5</sup> <http://www.depdagri.go.id/basis-data/2010/01/28/daftar-provinsi>



### 3. New Functions, Hybrid Structures

The second key challenge that Pustekkom has faced is the need to restructure itself to reflect its changing mandate. Pustekkom has reorganized itself into three key Divisions:

1. Radio, Television, and Film-Based Technology Development for Teaching and Learning;
2. Multimedia and Web-Based Technology Development for Teaching and Learning; and
3. Network/Connectivity Development.

In total, Pustekkom now has 227 staff, 70 of whom are administrative, 83 in the Radio, Television, and Film Division, 41 in Multimedia and Web-Based Technology Development, and 33 in Network/Connectivity Development. This reorganization of Pustekkom reflects a clear effort to discharge its new mandate: the legacy functions of the organization are all clustered into the first division, which focuses on broadcasting, while the other two are responsible for implementation of new responsibilities. Nevertheless, the use of the word 'Development' in each title still reflects a strong tendency within Pustekkom to approach its work as a function of *supply*, rather than shifting to delivery of *services* and facilitating *use* of technology. Perhaps the most obvious example of this is that the above organizational structure offers no clear location for the function of teacher professional development, although this has long been understood, both globally and within Indonesia, as a key requirement for effective ICT integration.

Having noted this, it is clear that there has been a concerted effort to expand Pustekkom's roles in each of the above areas, which is worth exploring in more depth.

#### Radio, Television, and Film-Based Technology Development for Teaching and Learning

This Division constituted the original core focus of Pustekkom, and has thereby generated a long track record of content development in different media. To date, it has produced over 8,000 video/television titles and in excess of 1,000 audio/radio titles. For its core business of television (TV Edukasi or TV-E), Pustekkom has two dedicated satellite channels, one for schools and one aimed at teachers and higher education institutions. To broaden the reach of its content, it also broadcasts content on the national channel, TVRI (*Televisi Republik Indonesia*), and has partnerships with approximately 80 local television partners that broadcast its content (although there is also a much wider network of up to 200 community-based television stations that are broadcasting Pustekkom content).

TV-E would ideally prefer to have its own dedicated terrestrial television channel, but a change in the law is required to enable this (Pustekkom used to have its own dedicated channel, but this was converted into a commercial channel in the mid-1990s). It is hoped that this legal change might occur in 2012, thus paving the way for launch of a dedicated TV-E channel, which would enable Pustekkom to save significantly on the fees it pays to TVRI to carry content. To broaden its reach further, Pustekkom also plans to launch an IP TV channel in 2012. It is currently digitizing its video archive in order to provide access to video-on-demand for its entire back catalogue (although the focus is currently on digitizing only those materials that are still considered educationally relevant for students in the 21<sup>st</sup> Century). Consequently, there is early evidence that, even in this area, Pustekkom is grappling with the challenge of reinventing itself for a digital world, in which the boundaries between broadcasting and Internet-based distribution of content become increasingly irrelevant as these distribution platforms merge online.

In the area of radio, Pustekkom has been producing audio programmes since its inception in 1978. In 2009, it launched the *Suara Edukasi* (Education Voice Radio), the latest iteration of its audio offering. Through this platform, radio programmes are broadcast via satellite and on an AM radio station operating around Jakarta. This content is aimed at school students.

Pustekkom's main challenge in this area is to measure the effect of its activities, as well as to participate in ongoing external evaluation activities that help to refine its strategic direction. There is currently no reliable data on how many schools have receiving equipment for the channels (i.e. televisions/radios and, where relevant, satellite equipment), including the many schools that have received such equipment from local governments. Although a survey is sent to schools annually asking about use of the services, no formal evaluation has yet been completed of the educational effectiveness of these services, and this is therefore a high priority activity for Pustekkom in 2012. The lack of any formal evaluation activity focused on Pustekkom's activities illustrates strongly a mindset that is focused primarily on supply of content, rather than facilitating its effective educational use.

## Multimedia and Web-Based Technology Development for Teaching and Learning

Indonesia has a rich and varied online landscape of educational materials, and production of multimedia and web content is now one of Pustekkom's core functions. Many of Pustekkom's materials can be found on its online portal, E-dukasi.net (<http://www.e-dukasi.net>). E-dukasi.net was established in recognition of the need for more online teaching and learning materials in local languages. Launched in August 2003, E-dukasi.net is intended to facilitate inter-school communication and collaboration, as well as the production of varied and abundant digital learning resources.

Overall, Pustekkom has registered some significant achievements with respect to online content, possibly the most notable of which is that all commercial publishers selling textbooks to schools in the country are required to make available PDF versions of their books available so that these can be placed online and downloaded free of charge (which makes Indonesia one of the most advanced countries in the world with respect to its efforts to harness the concept of Open Educational Resources, or OER, to the financial and educational benefit of students). In addition, though there is a vast and sometimes bewildering array of online content development initiatives, which mean that there is an abundance of educational content in *Bahasa Indonesia* accessible online.

However, a key problem associated with this explosion of content has been its decentralized nature. Between them, government educational structures have proliferated around 240 websites, many of which overlap in function and carry similar kinds of content. As might be imagined, there are also challenges with sustainability and quality assurance for many of these sites. Consequently, a key focus for Pustekkom currently is to consolidate all of these websites into a single, integrated web portal. This new portal has been dubbed the *Rumah Belajar* (House of Learning) and will function as the official portal for e-learning of the MoEC (<http://belajar.kemdiknas.go.id>). The objective of the portal is to provide learning resources, communication, and interactive facilities for education communities and is targeted at students, educators, and anyone who wants to learn.

There are several challenges in establishing the *Rumah Belajar*. Key amongst these is to review the quality and relevant of content from the disparate existing websites. Although a formal analysis has not been done, Pustekkom estimates that only 8% of this content will be useful and relevant currently. Consequently, working through the websites and auditing the quality and

relevance of content is a major undertaking, which may take as long as three years to complete. A final consideration in this regard is to ensure that content is suitable for download in contexts with limited bandwidth. Thus, there is also a need to ensure that content is in sizes that are easy to download, which Pustekkom has been seeking to do in its online content development activities (using formats and development approaches that keep file and HTML page sizes as small as possible). However, this problem will hopefully be less of an issue in future, as the Indonesian telecommunications environment is expanding rapidly, thus delivering more and faster connectivity across the country.

A next key challenge is to focus on ongoing production of new content. From this perspective, Pustekkom is placing strong emphasis on the creation of lesson plans by teachers, an estimated 15 to 18 of which are required per semester per subject. It has produced a template that teachers use to develop plans and has piloted this during 2011 through a series of training workshops for teachers. As a result, teachers have already begun voluntarily producing lesson plans and uploading these. These are uploaded without centralized quality control, the emphasis being on quality resources being self-selected as teachers start to use the content. In the longer term, it is anticipated that rollout of these activities will be driven by provinces working with and developing capacity of the district offices.

While these are all important developments and the consolidation of the educational web presence into a single *Rumah Belajar* is a necessary step to streamline the online experience for teachers and students, it remains striking that the dominant focus is on supply of content and website functionality. Significant investments have been made in producing online content, but there is little evidence yet of any formal effort to evaluate its effectiveness in classroom practice or to assess the extent of its take-up and use. As noted previously, the omission of a parallel emphasis on teacher professional development is a significant gap, as this has been proven globally to be a key requirement for effective take-up and use of online content and services. Likewise, the provision of web templates and facilities to enable teachers to produce and upload lesson plans reflects a belief in the idea that simply making online facilities available will translate into their extensive use by teachers and generate vibrant online communities of practice. Unfortunately, there is a long history of national and indeed global portals that have failed precisely because they focused predominantly on the supply of online services and content and inadequately (or not at all) on the conditions required to make target audiences both aware of their existence and motivated to integrate their use into daily teaching and learning practices. Thus, a major challenge moving forward will be to shift from simply producing content to developing a wider range of services that raises awareness of the potential of ICT use in the classroom, markets available services, and support teachers to develop the skills required to harness these effectively to support education in the country.

## Network/Connectivity Development

Central to its mandate to provide leadership on ICT in education, Pustekkom was given responsibility for *Jardiknas*, an Indonesia-wide connectivity project which uses a private network to provide internet access to one ICT Centre at each district office, with additional schools near that office connected via wireless networks. *Jardiknas* comprises three zones, targeting schools, education provincial and district offices, and universities respectively (although it has recently been decided to integrate these three zones into one network). From an architectural perspective, an important aspect of *Jardiknas* is the coupling of all traffic to a central point in Jakarta, which gives greater control over what users can do and access via the Network, but creates inefficiencies with respect to data traffic. Having initially established 4,344 nodes in 2006, *Jardiknas* subsequently grew to include 33,140 nodes in 2010.

In 2011, however, budget cuts required Pustekkom to scale down the number of connected schools early in the year, although financial plans were also subsequently made to supplement the initial budgets. Partly this has been achieved through the complementary SchoolNet programme, which is also managed by Pustekkom. This programme makes fixed broadband (ADSL/'Speedy') connections from PT Telkom (the incumbent telecommunications supplier in Indonesia) available to schools free of charge. In 2011, 32,678 schools were connected via either Jardiknas or SchoolNet. In addition, an undetermined number of schools are connected to the Internet through their own initiative and funds.

Although the number of schools connected represents a significant achievement, Pustekkom's activity faces key challenges in this area. Most notable amongst these are:

1. Budget allocations for Jardiknas and SchoolNet are made annually, which means that Pustekkom is only able to enter into one-year agreements with telecommunications suppliers. This creates significant problems, as tender processes are often not concluded by the time of expiry of previous contracts, leading to disruptions in connectivity supply.
2. Uncertainties about available budgets make it difficult to determine how many schools will be able to participate in the programme in each year. In both 2011 and 2012, Pustekkom has been required to make representations to Parliament to justify spending in this area, and was – in 2011 – forced to drop schools from the Jardiknas Network at the beginning of the financial year due to budget reductions.
3. In Indonesia, very strong emphasis is placed on suitability of content and services accessed online, with the result that Jardiknas has been established as a private network, with all data being routed through Jakarta. While the imperative to provide security to schools and students regarding the content and services that can be accessed is a key consideration, the resulting technical architecture for Jardiknas creates problems with latency and packet loss, which degrade the Network's performance significantly.

Again, these activities reflect strongly a mindset of supply rather than a focus on use, both within and around Pustekkom. The driving objective of both Jardiknas and SchoolNet is to increase the number of schools connected to the Internet, but there is little accompanying rationale for why this connection is essential to the school's operations. As the rationale for providing these connections is weakly defined (focusing on issues such as provision of access to the *Rumah Belajar*) and is limited by the number of schools that can be connected, there is little compelling political or educational incentive for sustaining these connections, a fact reflected in the annual budgeting processes and 2011's budget cuts. Unfortunately, this leaves Internet access at the margins of school behaviour, which reinforces the notion that its provision is both expensive and hard to justify. The provision of Internet access is not yet accompanied by a clear and compelling vision of how *all* schools in Indonesia will be transformed through provision of ICT infrastructure and Internet access and how this transformation will be both educationally effective and sustainable in the long term.

Although there are efforts to define this vision, they are largely happening around – and with support from Pustekkom – rather than being clearly led by it. This is partly because, understandably, the agency is anxious first to secure its political mandate clearly through reworking of the Ministerial Regulation of 2008. However, this tentativeness does also reflect Pustekkom's own internal challenges as it grapples with the implications of shifting from content supply to leading a process of systemic transformation through ICT integration. Pustekkom is undergoing a challenging change management process, as it transforms from being essentially a content production house to facilitating rollout of ICT and e-learning across the national education system. Although there are overlaps in these functions, the skills and management approaches required are significantly different, and there is still much work to be done in developing new skills and capacity within Pustekkom to enable it to discharge its new expanded mandate effectively.

This is particularly important currently, because Indonesia is well positioned to make much more effective systemic use of ICT in education. Up to 95% of all schools in Indonesia can already be connected to the Internet using today's telecommunications infrastructure. Of these, 78,000 schools can get fixed broadband connections, which would allow them full access to digital e-content and online services offered by the MoEC. Another 169,000 can be connected via mobile Internet. While not all of those schools would benefit immediately from broadband Internet connections, the rapid rollout of fibre-optic upgrades around the country means that the number of schools connected via broadband rather than slower connections can increase very rapidly over the next couple of years. This leaves fewer than 5% of schools that could not get Internet access today, other than through very expensive satellite connections. However, with the rollout of large telecommunication projects such as the Palapa Ring undersea cables and the ongoing roll-out of mobile networks in rural areas, the number of schools that cannot be connected to the Internet is set to reduce quite rapidly. At the same time, developments in solar technology and low-power devices mean that it is possible to get ICT into remote rural environments cost-effectively. Taking advantage of this potential affordably will, therefore, require a sea change in Pustekkom's current approach to delivery of Internet connections to schools.

## 4. Political Support

Pustekkom has been undertaking a significant and complex transformation as it has received a new operational mandate. This has been further complicated by the absence of a sufficiently clear policy defining this new mandate and by Pustekkom's own internal challenges of defining what this new mandate means for its daily operations and how it should prioritize activities between its legacy functions and its new ones. However, this challenge is also reflected in a wider challenge of needing to persuade decision-makers in Indonesia of the importance of investing in ICT in education, a problem clearly reflected in 2011's budget cuts to schools connectivity initiatives. Thus, Pustekkom is placed in a difficult position of having to defend expenditure on ICT in education, but is not yet optimally positioned in either policy or organizational terms to fulfil its ICT coordinating function. This is complicated by the fact that there are several stakeholders with interest and decision-making influence over education, including the Presidential Working Unit for Development Control and Supervision, the MoEC, District/Municipal governments, Central and Local Parliaments, and Local Education Councils.

Indonesia is a geographically vast and politically complex country. As an archipelago of over 17,000 islands, there is perhaps no other country where the challenges of delivering hardware and broadband connectivity to all schools in the country are so great, although recent rollout of connectivity has been sufficiently impressive to enable up to 95% of schools to access some form of Internet connectivity, as of 2011. However, terrains are difficult to negotiate in some provinces and distances across the entire archipelago massive. In addition, though, the country's political complexity has been a key driver behind the Decentralization Law, which effectively now means that financial decision-making is spread across 497 districts.

Further complicating matters, Indonesia has placed heavy emphasis on Internet security in its policies to date, and is particularly keen to ensure that school children are protected from harmful online content. While this is an understandable policy position, it has manifested itself in the form of a complex, expensive, and complicated underlying technical architecture for Jardiknas, which – in its current form – effectively prevents implementation of strategies to connect all schools to the MoEC, to their *kabupaten*, to each other, and to the Internet. Unless these technical hurdles are overcome in a way that remains politically acceptable, there is a danger that rollout of ICT in education will likely remain a largely supplementary and marginal activity in Indonesia, rather than becoming a key driver of systemic change and improvement.

The above problem is also complicated by the current annual budgeting process, which makes long-term planning for supply of connectivity to schools using central funding largely impossible (although schools can use their own allocated finances to purchase Internet connections). Annual budgets currently require Pustekkom to negotiate contracts with suppliers annually, which is both time-consuming and expensive. In addition, it means that Internet services to schools cannot be guaranteed for longer than 12 months, with the result that schools and their district offices are unable to make long-term changes to their operations based on expectation of reliable, sustainable Internet connections.

Creative political solutions and strong political leadership are needed to enable effective central coordination of ICT in education within this context. While Pustekkom can provide expert leadership in the area of ICT in education, it does require separate, higher level political support to perform this function effectively, as the organization is ultimately a structure within the bureaucracy of the MoEC and not a political entity – and thus subject to the normal hierarchical decision-making structures and processes of central government systems. Pustekkom can only effectively provide leadership in ICT integration when there is strong political leadership under which it operates. In this regard, though, Ministerial Regulations – while a useful starting point – are not sufficient expression of political leadership. A sustained commitment to systemic

transformation is required, combined with long-term budget allocations to enable this transformation to take hold across all schools in the country.

Fortunately, there is a growing political push, both within and beyond the MoEC (and of which Pustekkom is a part), to make ICT a central component of systems implementation in education in Indonesia. Increasingly, educational decision-makers within Indonesia understand that:

1. **Use of ICT can lead to improved information management** at the national, district, and institutional levels, which will also benefit teachers and students. This would include:
  - a. Increased reliability, validity and comprehensiveness of reporting by educational institutions, ensuring submission of Bantuan Operasional Sekolah (BOS) financial data) financial data and schools' rehabilitation monitoring and evaluation data through Special Allocation Funds (DAK) and General Allocation Funds (DAU) – effectively Educational Management Information – and thereby accelerating financial disbursements and strengthening monitoring processes;
  - b. Institutional improvement through the use of information to assess strengths and weaknesses and access support;
  - c. Transparency in the significant investments taking place to refurbish schools through the Government's Special Allocation Fund and by creating online refurbishment request tracking facilities connecting schools, districts, provinces, and MoEC; and
  - d. Evidence-based policy-making, planning and financial management.
2. **Increased communication and information sharing can help improve school performance.** Widespread 'ICT infrastructure' will help to strengthen MoEC management, while supporting school management and monitoring to increase educational institutions' accountability.
3. **Digital curriculum resources and distance education can help educators to improve their classroom practice.** Increasing participation in professional development for teachers can be accomplished cost effectively using e-learning, and can be combined with access to high-quality learning resources (currently being aggregated through the *Rumah Belajar*), with a particular emphasis on improving practices in rural and low-performing schools.

While the above activities would include a wide range of stakeholders, Pustekkom has a potentially significant role to play in coordinating their effective implementation.

If commitments to these kinds of systemic changes can be enshrined in a revised Ministerial Regulation for Pustekkom and accompanied by both strong political support and appropriate financing mechanisms, this should help the organization significantly to drive through the necessary internal change management and professional development processes (possibly accompanied by some further internal restructuring so that its structures reflect more clearly its new mandate) and play a key leadership role in ICT integration in Indonesia.

## 5. Conclusion

Pustekkom is the national agency focused on ICT in education in Indonesia, with a long and distinguished track record. It has fulfilled a critical role in producing educational resources in various media, with strong emphasis on supplying content in *Bahasa Indonesia* which would otherwise likely never have been made available to teachers and students in the country. As technological change has occurred through the proliferation of ICT both globally and within Indonesian society, Pustekkom has responded by expanding its mandate from broadcasting technology to encompass multimedia and web content, while also playing a critical role in supplying connectivity to schools in the country. In this regard, both it and Indonesia have registered important gains in ICT in education, as well implementing some truly innovative and unique initiatives in the field.

Nevertheless, the experience of Pustekkom as a national ICT in education agency with a transforming mandate yields some key lessons of potential relevance globally. These are:

1. Ideally, shifts in function of key national agencies should be accompanied by immediate changes to the legal and regulatory environment in order to ensure that these changes are clearly understood across the entire system and that roles of central coordination have a clear, enforceable legal basis.
2. As organizations are asked to play growing roles in coordinating ICT in education activities, this role should be accompanied not only by clear policy commitments and objectives (which are already in place in Indonesia at a high level), but also by long-term political support and financial allocations to enable achievement of stated objectives.
3. Most importantly, though, underpinning the establishment – or re-deployment – of any dedicated agency focused on ICT integration in education has to be a clear and compelling vision of how, systemically, ICT integration will transform the operations of education in ways that are both educationally effective and cost-efficient. If the function of a dedicated agency is simply to ‘provide’ hardware, connectivity, and digital content to a system that continues to operate largely as it did before the development of ICT, its impact will ultimately always be marginal and unsustainable in the long term.
4. Linked to the above, it will be essential to ensure that there is a systematic and ongoing approach to research, monitoring, and evaluation in order to assess what is working effectively and what is not. As the kinds of e-services envisaged are significant innovations, it is critical that there is a planning culture that makes provision for learning from practice and integrating these lessons as relevant into implementation strategies. This is essential in moving from a culture of *supply* to one of delivery of integrated *e-services* and facilitating *use* of technology.
5. As might be expected, significant shifts in core function of organizations should be accompanied by extended programmes of professional development and change management, both within and around those organizations, in order to ensure that the agency concerned feels confident to implement revised and expanded mandates effectively.

Despite these challenges, the future remains an exciting and promising one. Almost all schools in Indonesia are within reach of affordable Internet connections. If this growth in connectivity can be harnessed systematically, it can be used by Pustekkom as a mechanism to get all schools connected to the Internet, to each other, to district offices, and to the MoEC, so that the kinds of functions outlined in the previous section can be implemented to transform operations across the entire system. Thus, as technology penetration expands, political pressure to invest in ICT



in education mounts, and the changing role of Pustekkom is enshrined in a revised Ministerial Regulation, the organization is poised to be at the forefront of a significant digital and educational revolution in Indonesia.



## Annex 1: Pustekkom Timeline

The timeline below highlights key events and milestones in the history of Pustekkom.

**1968.** Two research studies supported by UNESCO were conducted. Emerson's research, 'Diagnosis of the present situation with identification of priorities development' concluded that educational radio and television programmes are an integral part of education, therefore needs to be prioritized. Jamison stated in his paper, 'Alternative Strategies for Primary Education in Indonesia: A Cost Effectiveness Analysis', that the fixed cost unit in basic education system improvement can be implemented by means of radio programmes in enhancing teacher-student ratio.

**1973-1974.** Pilot conducted to test radio broadcast programme in Central Java and Yogyakarta, lead by BPP (Balai Pengembangan Pendidikan or *Education Development Agency*) of the Department of Education and Culture and supported by UNESCO, ITB (Bandung Institution of Technology), UPI (Indonesian Education University), and IKIP Semarang (Semarang Teacher Training Institute).

**1976.** Minister of Education and Culture formed TKPK or *Teknologi Komunikasi untuk Pendidikan dan Kebudayaan/ICT for Education and Culture* task force at national, provincial, and district level: *National TKPK:* Jakarta, Semarang (Central Java), Yogyakarta and Surabaya (East Java); *Provincial:* in 11 provinces (Irian Jaya, Maluku, South-East Sulawesi, Central Sulawesi, South Sulawesi, East Nusa Tenggara, West Nusa Tenggara, East Kalimantan, Central Kalimantan, West Kalimantan, and West Java); *District:* 9 districts in 3 provinces (names to be completed and confirmed).

**1978** (30 September). TKPK task force upgraded into Centre for Communication Technology for Education and Culture or *Pusat Teknologi Komunikasi untuk Pendidikan dan Kebudayaan* and abbreviated to Pustekkom.

**1979.** Pustekkom, in collaboration with TVRI (Indonesian National TV), started to develop and produce ACI (Aku Cinta Indonesia) TV serial.

**1980** (11 September). Former provincial and districts TKPK changed into *Balai Produksi Media* or Media Production Centres and *Sanggar Tekkom* or Education Communication Technology Workshop.

**1990-1996.** Pustekkom, in collaboration with TPI (Televisi Pendidikan Indonesia) or Indonesian Education Television, produced learning materials for Junior and Senior Secondary schools and broadcast them four hours per day at TPI.

**1996** (5 February). Minister of Education and Culture opened new 7 Education Communication Technology Workshops in Aceh, Riau, West Sumatera, Jambi, South Kalimantan, and East Timor (East Timor workshop is no longer functioning due to the country's independence).

**2000** (24 January). Pustekkom was given a new mandate to expand the scope of work to integrate the information component into its work. It became an Information and Communication Technology Centre for Education and Culture. The acronym 'Pustekkom' is still retained.

**2004** (14 October). Television Edukasi (Educational television) broadcast via satellite throughout the country. TV-E presently has two channels, one for learners and one for educators.

**2004-2005.** Based on the Local Government Autonomy Law, all media production centres and communication technology workshops were handed over to provincial governments and continue working with Pustekkom based on coordination mandate. To date, Pustekkom coordinates 32 *Balai Tekkom* (Technology & Communication Center) at provincial level.

**2004.** Pustekkom established first international cooperation for Television Edukasi with Japan Foundation Indonesia. TV-E received 85 educational programmes (science, and math) from NHK International to be broadcast through Japan Foundation Aid. The programmes gained huge attention from TV-E's audience, the audience gave feedback after seeing the programme

by SMS and telephone, expressing their opinion about the programme. The programme aired from 2004 until 2006.

**2005.** Ministerial Regulation # 23 (2005) issued to provide mandate to Pustekkom as one of MoEC's institution responsible for ICT use in education, in which Pustekkom is to report to the Minister through the coordinative function of Secretariat General. *Also that year:* Pustekkom established partnerships with Local TV to broaden the access of TV-E across Indonesia.

**2006.** Jardiknas rolled out to 4,344 nodes. *Also that year:* Pustekkom signed MOU with TVRI (Indonesian National Television) to broaden TV Edukasi's access through terrestrial. (MOU was due to end in 2011, but will be renewed for an additional five years).

**2007** (21 August). First issue of 'technology' journal (*Teknodik*) published. *Also that year:* Pustekkom signed MOU with Goethe Institute to produce a basic German language learning programme German Language Programme *Radio D*, targeting an Indonesian audience.

**2007.** Pustekkom started to relay International TV Programmes.

**2008** (16 July). Ministerial Regulation #38 signed, giving Pustekkom overall responsibility to develop, foster, and evaluate activities in the field of educational technology and use of ICT for education. (26 August). Radio-edukasi launched and broadcast via satellite throughout the country. (October). Pustekkom SchoolNet (Speedy) service initiated. *Also that year:*

Pustekkom handed formal responsibility for the ICT and education arena in Indonesia (based on Ministerial Regulation #38 of year 2008). Pustekkom and Goethe Institut produce another adaptation programme called 'Einblicke', focused on culture and education in Germany. Pustekkom and the Open University do joint production supporting the students of the Open University in their studying.

**2009.** Pustekkom and the Goethe Institut produced another programme, *Willkommen*, based on the book published by Goethe majoring in tourism.

**2010.** Jardiknas grew to include 33,140 nodes. *Also that year:* Ministerial Regulation #36 (2010) issued to alter Pustekkom 'sorganizational structure. Three divisions were formally established: (a) Radio, Television, and Film-based Learning Technology; (b) Multimedia and web-based technology; and (c) ICT Network Development.

**2011.** Pustekkom initiated process of consolidating wide range of educational content that has been produced and made available in different forms so that it can all become accessible via a single web address.



## Appendix 2: Pustekkom Organograms

Figure 1 Pustekkom's organizational structure

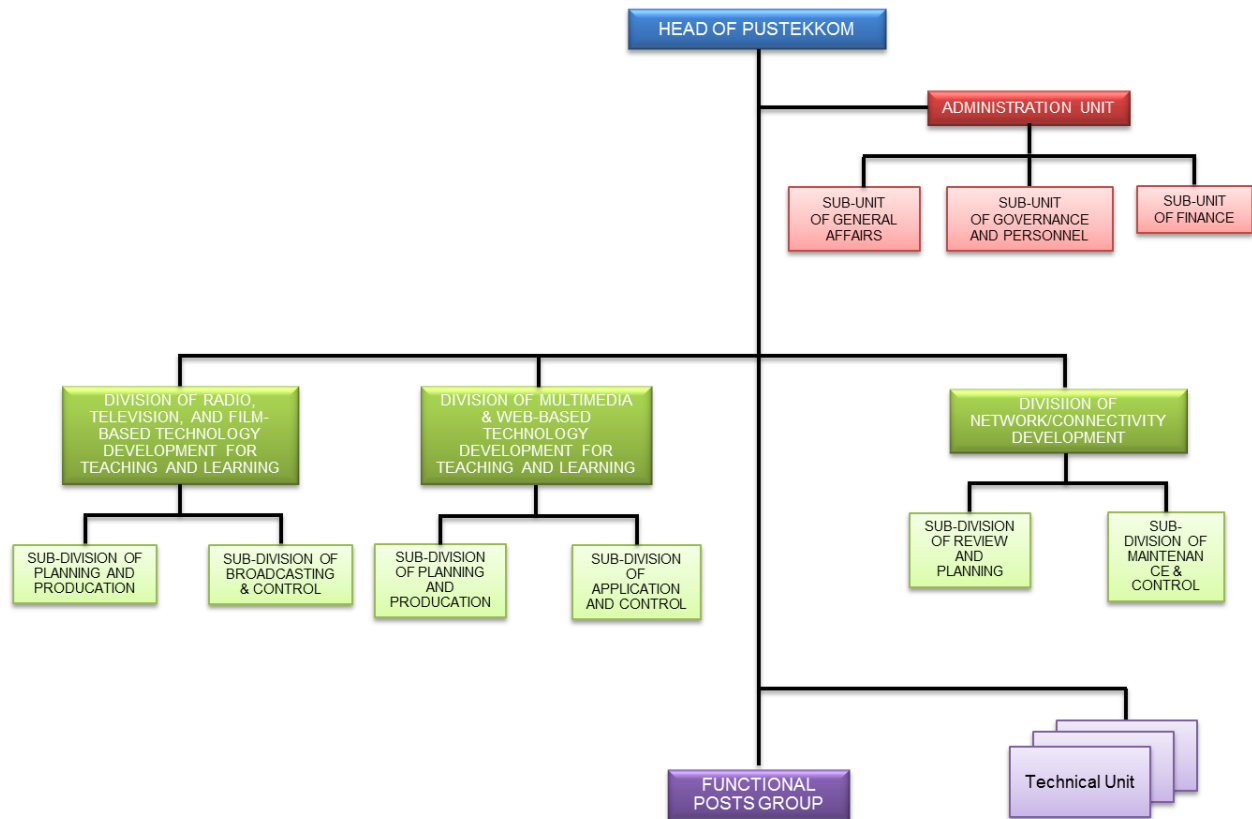
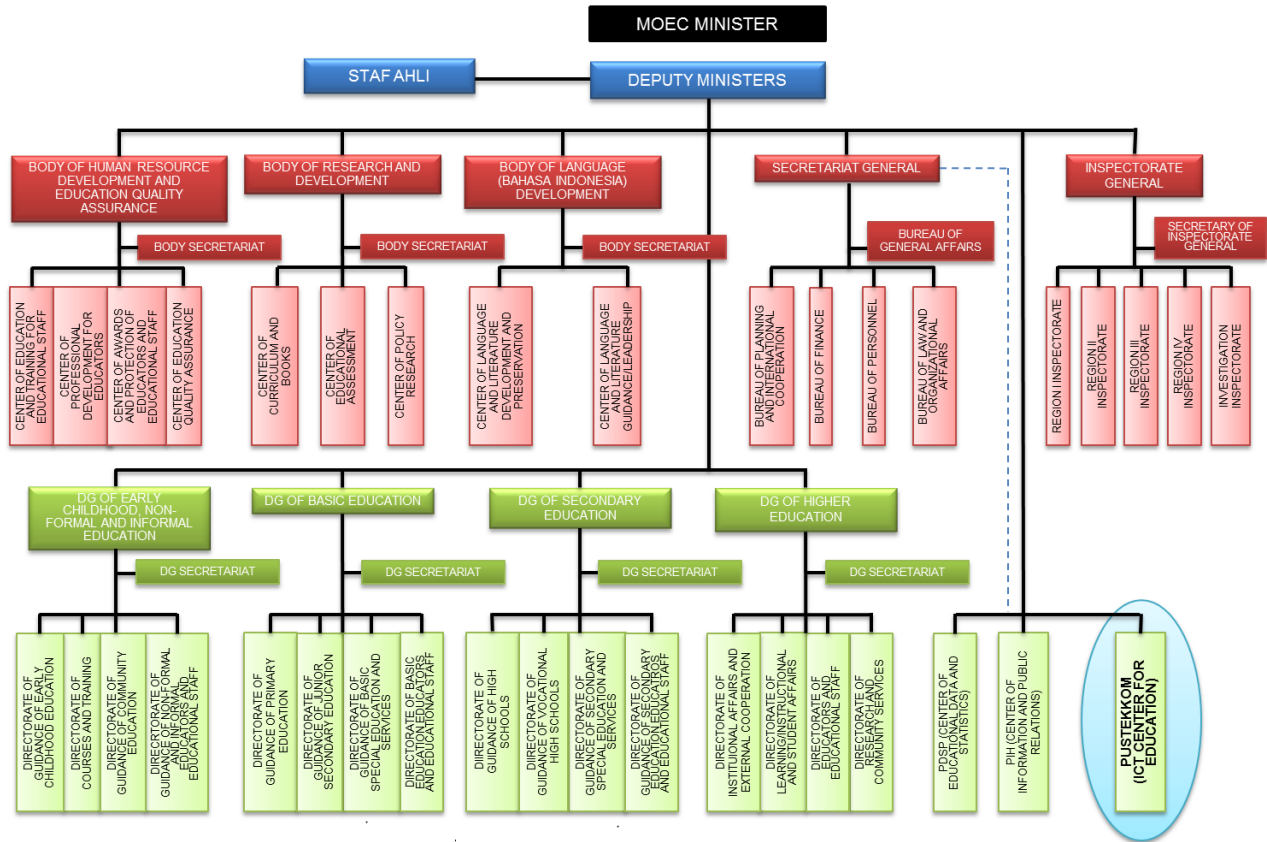


Figure 2 Pustekkom's relationship to other key actors and stakeholders within the MoEC Organisation Structure



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