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Information and communications technology in food assistance

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1. Introduction

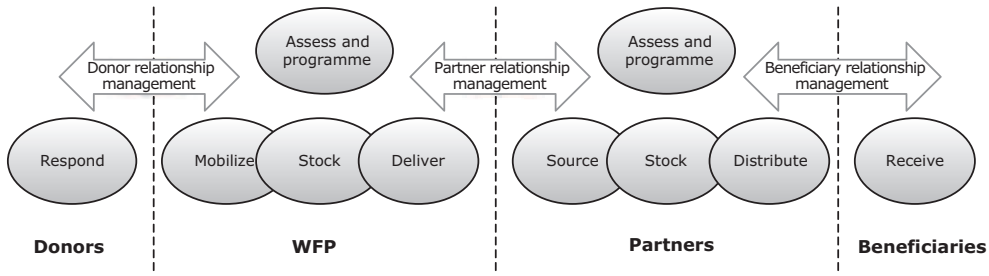
Information and communications technology (ICT) refers to the range of technologies that allow the gathering, exchange, retrieval, processing, analysis and transmission of information. The rise of ICT as a tool for general interaction is evident from the wide acceptance of the Internet as a platform for communication and knowledge sharing, and from the pervasive adoption of mobile communications all around the world. Internet users grew from 183 million people in 1998 to 1.542 billion in 2008. During the same period, subscribers of mobile cellular telephones grew from 490 million to 4.1 billion (International Telecommunications Union, 2009).

These developments, more social than technical, have had an impact on the way global organizations conduct business. Humanitarian organizations are no exception. Most stakeholders – donors, United Nations agencies, civil society, non-governmental organizations (NGOs) and even beneficiaries – now rely on technology to varying degrees. This has led to changes in the ICT functions of humanitarian organizations such as WFP, where information technology has evolved to the point where it not only provides operational support, but has also begun to change and enable programmatic activities through new capabilities. In particular, ICTs in food assistance programmes have advanced from being personal productivity tools to becoming tools for extending and optimizing end-to-end supply chain processes. This chapter examines the various approaches and trends in the use of technology to support the mobilization and delivery of food assistance.

2. The humanitarian supply chain

A *supply chain* is defined as a system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer.[1] In the context of food assistance, this refers to the process of delivering commodities or other assistance from donors to beneficiaries. This is not a single chain, however, but a series of linked supply chains in which WFP's internal supply chain forms the core, facilitating the delivery of food assistance from donors to the implementing partners that distribute it to end beneficiaries. Figure 18.1 shows the series of supply chains in this process.

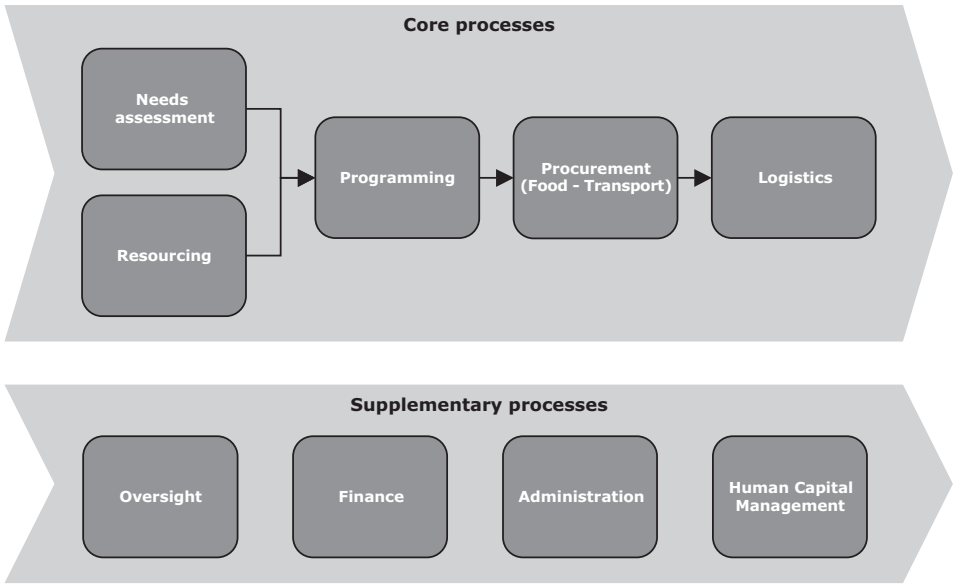
Figure 18.1 Humanitarian supply chain



Three critical processes connect these supply chains from the point of view of WFP: *donor relationship management* involves working with donors to understand country needs, mobilize resources and report on the overall results and outcomes of food assistance; *partner relationship management* involves working at the country-level with governments and implementing partners, to manage demand and set up the mechanisms and capillary distribution channels needed to bring food assistance to distribution points; and *beneficiary relationship management* refers to partners' processes in managing the distribution of assistance to beneficiaries.

Within each individual supply chain, organizations have critical core processes, such as needs assessment, resource mobilization, programming, procurement, warehousing, transportation, and monitoring and evaluation. These are facilitated by supplementary functions, such as financial management, human capital management, project management and oversight. These processes are represented in Figure 18.2.

Figure 18.2 Organizational processes



These process frameworks are the basis for applying the technologies needed in food assistance. To streamline the whole end-to-end supply chain, organizations and practitioners must optimize both internal and interconnecting processes. Information technology supports this interconnectivity by providing the foundation for implementing business processes (Ross, Weill and Robertson, 1995). In this context, ICTs are deployed in two dimensions:

1. The information systems that are used to link and support the core and operational processes within each organization are called *line-of-business* systems. The goals for ICT are to ensure that essential processes and information are integrated through solutions and applications. In food assistance scenarios, these applications range from those supporting basic finance, administration and logistics, to solutions supporting food monitoring, assessments, distribution and camp management activities.
2. Technologies are also used to provide the platforms and tools through which knowledge can be shared and collaboration and communication can occur among various stakeholders involved in the process; these technologies are sometimes called *productivity tools*. The goals for ICT include fostering a learning culture through communities of practice involving geographically

separated peers, providing voice communication services for workers in remote or insecure areas of operations, or supporting information sharing for staff with intermittent online access. Technology solutions to support these include websites, forums, learning management systems, instant messaging tools and content replication tools.

The ICT challenge has always been to ensure that there is adequate application support to allow the automation of critical transactional processes, and that appropriate technology is in place to encourage the desired collaborative and knowledge sharing behaviours to support these processes.

3. Technology framework

WFP's use of information technology can be classified into three broad areas (Figure 18.3):

- *Front-end services* refer to technologies that are directly handled by end-users, and may include software, hardware or communications technologies.
- *Middleware* services refer to the underlying technologies to support the tools that end-users utilize, typically solutions or technologies such as databases, workflow or mail systems, Geographic Information Systems (GIS) and others that make up the application platform.
- *Infrastructure services* refer to the basic server, operating system or telecommunications services on which both middleware and front-end services rest.

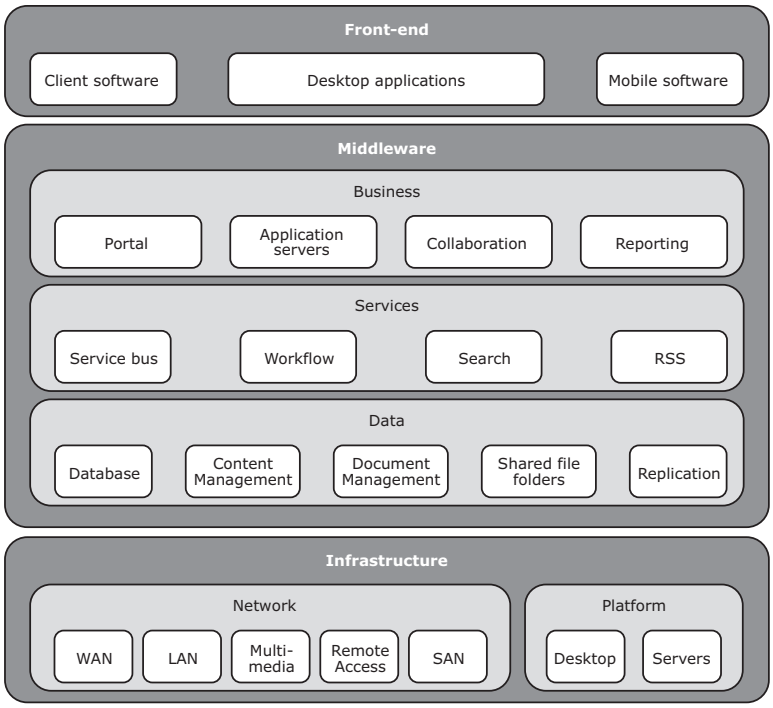
Adapting technology to new processes revolves around customizing components of this model to suit process or collaboration requirements. This could mean adapting existing technologies or techniques to address old problems in new ways, or putting together new technologies to deliver a new business capability.

3.1 Supporting the food assistance supply chain

Within WFP, a significant portion of core organizational processes are automated through *enterprise resource planning* (ERP) software systems. ERP provides an integrated, standard operating environment essential for the smooth functioning of a global organization. As a ready-to-use package, adoption of an ERP system typically means conforming to some of the best practice processes used in industry. WFP's ERP system supports the basic supplementary processes that allow the delivery of food assistance – from fund management, asset management, financial management, budgeting, procurement and travel, to human capital and ocean transport management.

Although ERP systems cover extensive areas of operation for a global supply

Figure 18.3 Technology framework



chain, as commercial off-the-shelf solutions they cover only a portion of the processes needed by a humanitarian agency. Other solutions are needed to manage processes unique to the food assistance scenario. Sometimes, special operating environments or poor infrastructure drive the choice of technologies used.

One of the challenges in deploying an ERP system is to bring it to the hands of the people who need to use it. To this end, WFP has built a robust satellite-based global telecommunications network called *FOODSAT,* which connects offices in 89 capital cities. *Thin-client computing* technologies from Citrix were deployed to deliver applications to all connected offices. In thin-client computing, servers host the main computer software, and client personal computers (PCs) are used only to host graphical user interfaces. This approach has allowed WFP to lower the client PC requirements and minimize the impact of deployment. More significant, it minimized the bandwidth requirements needed in the global network, helping to reduce operational costs.

3.2 Mapping technologies

The availability and usefulness of Internet-based map information services such as Google or Bing Maps have driven home the value of maps and location-based services in general. These are based on *GIS* technologies to collect, build and inventory spatial data and maps. Such technologies integrate and apply spatial and non-spatial databases for integrated analysis, and are used to communicate and share geographic knowledge.

In food assistance, these technologies support processes related to, among others, food security analysis, contingency and emergency planning, early warning systems and logistics planning, by integrating data captured in the field with spatial data to support decision-making, as displayed in Figure 18.4.

For example, GIS technologies are used in WFP's Emergency Preparedness and Response Web (EPWeb)[2] and in the GeoNetwork Opensource[3] service, which provides a publicly available repository for geo-referenced databases, cartographic products and other related data (for more details on emergency preparedness tools see chapter 17).

Figure 18.4 WFP's EPweb

3.3 Web portals

Web portals are web-based Internet technologies that aggregate information from diverse sources in a unified way. They contain standard web search features and offer custom services sensitive to the identity of the user accessing the portal. GIS information is often exposed through web portals, in many cases using publicly available mapping sources to construct the base map layer.

As well as distributing information, portals are increasingly used as a platform for *Intranets,* which are websites used for collaboration among geographically distributed teams within a single organization. Portal technologies from Liferay, Drupal and Joomla have been used within WFP.[4] In the context of food assistance, there are examples of portal technologies – called *Extranets* – being used to drive collaboration among partners, such as www.nutrinet.org (Figure 18.5).

Figure 18.5 Illustration of Nutrinet

Convened by WFP, with government support, this portal brings together information, expertise, knowledge databases, discussions and contacts in a joint effort to manage knowledge and strengthen the capacity of Latin American countries to design and implement effective programmes for combatting hunger and malnutrition. The portal has become a vibrant community of food security practitioners in Latin America, and is being replicated elsewhere in the world.[5]

4. Mobile technologies

Hand-held devices, personal digital assistants (PDAs), mobile phones or smartphones allow information to be stored at the point of capture and, in the case of mobile phones or smartphones, may be used to communicate the results back to office. In the context of food assistance, these technologies are typically used in field data collection processes, when conducting household surveys related to food security and vulnerability assessments. Entering information at the point of capture improves data quality and security, reduces data access time and eliminates the use of printing materials.

For the past ten years, hand-held devices have been extensively used for WFP data collection in the South Africa and Asia regions. WFP has developed PDASurvey[4] software for creating questionnaires in the field. This has been used in at least 15 countries in more than 50 assessments. Questionnaires are created by the staff running the surveys, without assistance from software developers. A key innovation is the use of global positioning systems (GPS), ensuring transparent geo-referencing, with use of external GPS terminals as the preferred approach, to conserve PDA power.

For PDAs, non-volatile memory cards such as SDCards are used for the manual transfer of both data and programs, making archiving simple and secure. With the increasing availability of mobile cellular networks, projects have been implemented using these networks as the data transport mechanism. In general, adoption of this approach has remained fairly limited, owing to infrastructure and capacity constraints. In food assistance, recent pilot deployments have utilized mobile phones for staff and food monitors to send cross-border trade information from border locations in various countries; short message services (SMS) or text messaging is used to transport the data being captured. This requires careful user training, as it is up to the operator to ensure that the SMS message containing data is in the expected format. Data entry errors are dealt with by the back-end system, verifying correctness via return SMS. Although it has limits, this technique is low cost and works in settings where survey or monitoring staff have cellular equipment.

4.1 Combining hand-held and wireless communications technologies

Recent developments within WFP have enhanced mobile standards by investigating ways of merging mobile computing platforms with wireless radio communications technologies. The need for this arises from the data collection and dissemination requirements of humanitarian workers in locations where radio or satellite phone are the only telecommunications means available. The *Emergency Preparedness Information Centre (EPIC)* project is an initiative to enhance WFP's field information systems and communications capability by redefining mobile computing and communications standards. It replaces the current legacy radio infrastructure, which supports only voice communications, with a new standard able to support voice and application integration over wireless. Hand-held devices – extensible with add-on tools such as barcode readers, radio frequency identification (RFID) readers and GPS terminals – can now provide capability to automate processes in locations without publicly available technical infrastructure, such as those found at WFP's final distribution points. Wireless connectivity may be provided via VHF, WiMax, WiFi or even cellular technologies, where these exist.

EPIC will allow the streamlining of commodity hand-over and tracking processes through the use of location-stamped electronic waybills or proofs of delivery, and will facilitate monitoring and evaluation by supporting household surveys and food distribution monitoring, even in remote places without cellular or commercial telecommunications coverage.

As well as its use as a mobile data-entry platform, the EPIC device is also the primary security telecommunications tool, capable of sending and receiving text messages integrated with instant messaging, e-mail and voice communications. In areas with security issues, the device's position can be traced from a central console, which is useful for tracking staff for safety and security purposes.

5. Beneficiary identification

One of the challenges in food assistance has been to ensure that assistance goes to the right beneficiaries. A number of mechanisms have been explored, from voucher and coupon modalities to those relying on biometric identification for distributing food. Food ration cards are typically used in general distribution. In some countries, these have been turned into voucher-based processes augmented by technology. Important examples are:

- distribution of vouchers via SMS, such as in the Syrian Arab Republic, where beneficiaries are well-equipped with mobile phones (chapter 5);
- smartcards containing beneficiary identification, such as those issued in

India, where assistance is redeemed from authorized distributors who, on handing over food assistance, detract its value from the smartcard;
- food ration cards that include biometric data – photos and other biometric information – such as in Pakistan, where beneficiaries follow a biometric identification process based on retina scans during distribution;
- biometric information such as fingerprints, used to identify beneficiaries in, for example, camps managed by the Office of the United Nations Commissioner for Refugees (UNHCR) in Kenya and the United Republic of Tanzania.

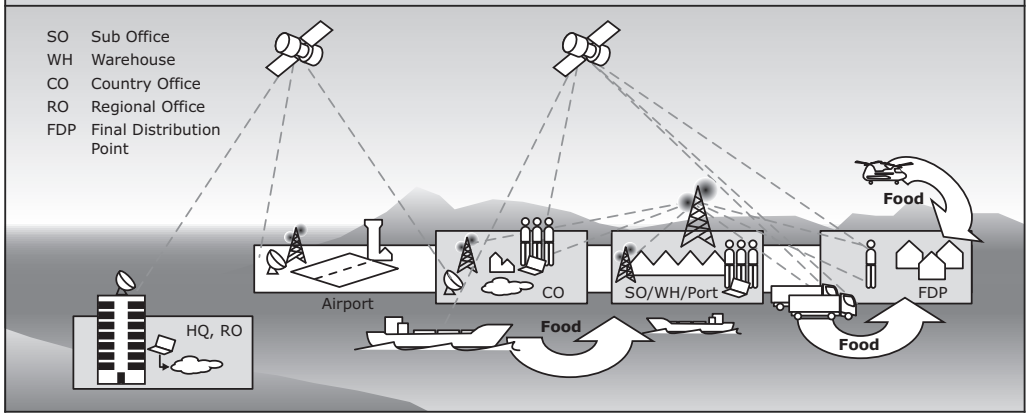
The use of biometrics to identify beneficiaries is in its early stages at WFP, but there is a clear case for continuing with it, as a way of reducing multiple registrations and fraud. Biometrics use at other United Nations agencies, such as UNHCR, has led to increased accuracy in beneficiary enumeration, but important challenges remain. Policies on data protection issues must be in place, especially for cross-border needs. Processes must ensure that the biometric information is used for only its intended purpose. Technology needs to ensure that accuracy is high, and that the identification mechanism is culturally acceptable to the beneficiary population.

6. ICT in emergencies

Food assistance interventions during emergencies have unique requirements. Sudden-onset emergencies typically require the deployment of complete supply chain infrastructure, supported by ICTs with no lead times and short deployment times. WFP's planned food response – how and where to deliver food assistance – is the key factor in designing an ICT response. The number, size and location of offices and warehouses determine the requirements for information technology, telecommunications and power infrastructure, and associated staff support. The ICT infrastructure being deployed must support information and communication flows between country and sub-offices. For larger emergencies, command and control may need to be equally visible from regional offices and Headquarters. Figure 18.6 shows the overall concept of operations for ICT deployments in emergencies.

The deployment process relies on a quick needs assessment by a senior ICT officer, deployment of stand-by emergency assets, and increase of ICT support and infrastructure coverage as other staff arrive in the operational area. Response times from assessment to initial deployment can be as little as 24 hours, as *fly-away ICT kits* able to support small offices are always ready for deployment. Fly-away kits contain pre-configured ICT equipment that when

Figure 18.6 ICT emergency concept of operations



installed, provides self-contained ICT services for up to 25 staff. They include laptops, hand-held radios and wireless network equipment for setting up an office, and a satellite (VSAT) terminal to connect the office to global networks.

Emergency response personnel are on call to provide the first support in case of an emergency. In addition, an extensive network of stand-by partners composed of technical staff from private or government emergency units are available to engage and support the surge capacities needed in a wide-scale emergency response.

7. Linking the humanitarian supply chain

This chapter has illustrated some of the ways in which WFP uses technology and technological techniques to fulfil its role as the provider of food assistance in development and emergencies. Looking to the future, WFP continually seeks to leverage appropriate information technology for its operations, while remaining sensitive to business efficiencies and organizational norms. Tighter integration with donors and partners is the goal for technology, increasing facilitation and linkages in the flow of food assistance from donor to beneficiary, and providing a return path of information from beneficiaries to donors.

To respond to the needs of the times and to optimize the humanitarian supply chain, donor, WFP and partner supply chains must be connected. Situated between donors and partners, WFP is well placed to serve as the catalyst and provide the critical linkages for a unified humanitarian supply chain. Such process integration can be accelerated through the use of appropriate information technologies.

[1] http://en.wikipedia.org/wiki/supply_chain.

[2] EPWeb is managed by the Emergency Division, WFP.

[3] GeoNetwork Opensource is managed by the Vulnerability Assessment and Mapping Unit, Emergency Division, WFP.

[4] There has been increasing use of open-source software (OSS) in this area. OSS allows end-users the right to use and change the code, and is typically free of charge.

[5] Through a project between the Economic Community of West African States (ECOWAS) and WFP (2010).

[6] PDASurvey was created by the Vulnerability Assessment and Management Unit, Emergency Division, WFP.