# 'An analysis of the alignment and integration of Learning and Development interventions for engineers in the Medical Technology sector in Ireland'

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# Contents

# List of acronyms

CIPD – Chartered Institute of Personnel and Development

CIRO – Context, Inputs, Reactions, Outcomes

CMO - Context, Methods, Outcomes

HRM – Human Resource Management

KSOAs – Knowledge, Skills, Abilities and Other characteristics

L&D – Learning and Development

OP – Organisational Performance

ROE – Return On Expectation

ROI – Return On Investment

RBV – Resource-based View

SHRM – Strategic Human Resource Management

SPSS – Statistical Package for the Social Sciences

# Chapter1: Introduction/Overview

It has been suggested in academic literature for more than a decade that knowledge-driven industries, such as the Medical Technology (Medtech) sector, are increasingly reliant on Learning and Development (L&D) to improve individual learning, facilitate strategic organisational imperatives and act as a link between Human Resource Management (HRM) strategy and overall business strategy (McGuire *et al.* 2008, Torrington, Hall and Taylor 2004). Bould and Garrick (1999) argue convincingly that learning has moved from a supportive, peripheral role to being central to individual and organisational effectiveness, with little room in the modern workplace for employees who are unwilling to engage in competence development through learning or managers who fail to foster a learning environment in organisations. Gunnigle *et al.* (2017) note that Learning and Development has become a national priority in Ireland due to competitive market functioning, internationalisation, skills gaps, pressures from technological innovation and new ways of working. Connaughton and Staunton (2017) in their recent survey on the state of L&D in Ireland report that 59 per cent of respondents identify talent management as a top priority over the next number of years, 78 per cent of organisations are experiencing skills shortages and the average spend on L&D was 3.8 per cent of payroll with interventions focussing on culture change, systems development/training, coaching and mentoring and performance enhancement.

The Medical technology (Medtech) sector in Ireland is one of five global emerging hubs, employing over 29,000 people and is the second largest employer of Medtech professionals in Europe. Ireland has annual exports of €12.6 billion in the Medtech sector and 18 of the world's top 25 medical technology companies have a base in Ireland, while 50% of the 450 Medtech companies based here are indigenous (Irish Medtech Association, 2017b). The Irish Medtech Association (2017a) estimates that there will be an additional 376 engineers or 23 per cent required in the sector by 2020. There is considerable scope for growth in the Medtech sector in Ireland, with a recent survey by the Irish Medtech Association finding that 'over 78 per cent of survey respondents have transferred staff internally and 78 per cent of organisations have provided internal upskilling programmes. 50 per cent of survey respondents stated that they had to pay a wage premium to attract suitable employees', while 88 per cent of respondents found that current skills shortages had an adverse impact on growth (Irish Medtech Association,2017a, p.41).

This research seeks to investigate theoretical best-practices from an academic setting and assess whether it is being applied in a specific industry (the Medtech sector in Ireland) and whether workplace learning is improving the competence of a specific cohort of employees (engineers), which

should, in theory, lead to improved individual and organisational performance. Investigation into the literature surrounding the interrelated areas of Strategic Human Resource Management, Learning and Development, Talent Management, Competence Development and Organisational Performance provides a number of common themes and shortcomings that inform this research.

In relation to Learning and Development and its alignment and integration with the strategic objectives, as argued by Montesino (2002), the more closely employees perceive that solutions are aligned to the strategic objectives and direction of the organisation, the more likely they are to be incorporated on the job. This research can be placed in the broader debate about Strategic HRM by adopting a RBV approach, where the competences of individuals are seen as making a key contribution to the competitive advantage of the organisation. The literature review and methodology sections will demonstrate that a practice gap exists in relation to empirical research on L&D and its practice in industry as well as little feedback on the experiences of those that are the focus of these initiatives. This research will address the practice gaps and sporadic methodological approaches by adopting a mixed method approach to both the designers and implementers of L&D in a specific industry and those who experience L&D in order to assess the alignment and integration of L&D with their organisational objectives.

Learning and Development as noted by Saha *et al.* (2017) goes right to the heart of Human Resource Management (HRM), wherein HRM is a consistent approach to the management of the most valuable asset in the organisation: it's people, who collectively contribute to achieving organisational performance. Saha *et al.* (2017) also concluded in their findings that enhancing organisational learning is important for the HR strategy of an organisation in order to ensure its success and sustainability. The requirement to align HRM in general and L&D in particular is outlined by Loshali and Krishan (2013), who demonstrate that strategies for enhancing organisational profits and organisational performance are rooted in aligning HRM/L&D practices and policies with the organisations goals and objectives. Wexley and Latham (2002) argue that Learning and Development can contribute to individuals' skill, self-awareness and motivation to engage with their work, while Harrison and Kessels (2004) note that as organisations become more knowledge-driven, Learning and Development is becoming more important for individual learning needs and strategic organisational imperatives. Torrington *et al*. (2004) note that line managers are increasingly taking on responsibility, or having the responsibility for HR thrust upon them; however, Purcell and Hutchingson (2007) argue that line managers do not always 'transmit the articulated values of top management' (Purcell and Hutchinson, 2007, p.5) but rather may reflect their personal preferences or the informal culture of the organisation. Wei (2006) outlines the interrelationship between HRM, competence and skills

development and organisational performance in a succinct manner, stating 'the strategy of a firm is a reflection of its response to the competitive external changes, a human capital pool with a broad array of skills that are compatible with the corporate strategy, is a catalyst for fulfilling the strategic goals through promoting behavioural utility among employees' (Wei, 2006, p. 50).

Wei (2006) also points to the general approach in SHRM that looks at Horizontal fit or integration which refers to the similarity across the organisation of different HR practices including L&D, as well as the Vertical fit or alignment which refers to the alignment of strategic management process of the organisation. 'Vertical fit is viewed as a critical step toward attaining the organisational goals through initiating some human resource activities that are aligned with firm objectives, while horizontal fit is essential when making good use of these resources' (Wei, 2006, p. 51). Huselid, Jackson and Schuler (1997) in outlining the Resource Based View (RBV) of the organisation suggest that organisations can use technical HR activities such as L&D interventions to differentiate themselves from competitors and that HRM activities which are integrated or aligned with the company strategy can make their human resources inimitable. Jhajharia and Kaur (2015) found that in order for integration of HR practices to take place there is a requirement for Senior HR Managers to take place in the strategic decision making process within the organisation and for Human Resource strategies to be designed in the context of business alignment and strategic objectives. It has been argued that for L&D to be strategically aligned it must encompass 'the design and delivery of performance support products and services – for example, producing and delivering the products and services clients request. From another perspective it encompasses a strategic role in organisations dedicated to aligning the workforce to execute organisational priorities' (Guerra-López and Hicks, 2017, p. 14). Nutt (2008) demonstrated that a discovery-based approach, using empirical research and using hard evidence in the decision making process of an organisation is superior to an idea imposition approach, as the former is more likely to deliver utility to an organisation, while the latter is more likely to ignore any evidence that counters the tenets of the idea.

Adhikari (2009) found that strategic management requires the creation of organisations which are capable of learning, unlearning and relearning and HR professionals that help to integrate organisational goals and objectives through the creation of a learning environment. Odiyo (2013) states that strategic management should seek to create a learning organisation that facilitates the creation and dissemination of knowledge and modifies the behaviour and skills of employees. It is also detailed by Odiyo (2013) that successful strategic HR initiatives, including L&D, will be linked to the bottom line of a company and will be able to demonstrate how it delivers to this bottom line. Grigg (2003) also suggests that the management of Human Resources in an organisation should contribute

to shareholder value and thus HR Managers need to measure the return on people practices to evaluate which add the most value.

## Purpose Statement:

The objective of this research is to assess if academic best practice is in place in the Medtech sector in Ireland. This best practice (as detailed further in the literature review section) suggests that L&D practices and interventions should be aligned to the organisation's objectives and goals and integrated through the organisation. The L&D interventions should seek to improve individual professional competence, which in turn improves divisional/organisational performance.

Organisational Goals and Objectives
- Organisational Goals and objectives are defined and communicated
- These include L&D goals

L&D interventions
- Aligned to the strategy, goals and objectives of the organisation
- Integrated throughout the organisaiton, reflected in work practices

Individual Competence Development
- KSAOs of individual engineers is improved through aligned and integrated L&D interventions

Improved divisonal/sectoral/organisational performance
- In Knowledge-intensive organisations such as the Medtech sector there is a requirement to improve the competence of technical staff to achieve competitive advantage.

## Problem Statement:

Essentially, despite the large financial investment into the Medtech Sector in Ireland, the skills deficits that has been reported and the importance of L&D interventions in closing said skills gaps, there has been little/if any academic research into this area. Investigation into the academic research on L&D interventions from different sectors and different economies around the world suggests that the alignment and integration of L&D interventions focused on competence development develops individuals to be more engaged, committed, satisfied and productive in turn facilitating the achievement of organisational goals and objectives.

## Significance:

In my professional capacity as a Learning and Development consultant with the professional body for engineers in Ireland, I was struck by the commitment to L&D among a variety of engineering-led organisations in Ireland. Many of these organisations are in the Medtech sector, which is undertaking technically complex work, generating considerable revenue and making significant investments in L&D. While there is considerable investment, there appeared to be variation in the interventions undertaken in organisations and an uncertainty as to what interventions were most successful, how the interventions could be aligned with the organisational strategy and integrated through the organisation, and whether they were delivering organisational performance. This research aims to deliver a clearer picture on whether L&D is aligned and integrated, if individual engineers' competence is being developed and if competence development aligned to organisational objectives and integrated through the organisation is delivering performance.

## Research Objectives:

As per Creswell's (2013) observation, in a mixed method study the research questions should narrow and focus the purpose statement. He suggests beginning with a quantitative phase which introduces a number of hypotheses and a second phase where qualitative data helps to explain the results from the quantitative phase.

The questions for the quantitative phase are as follows and will be asked on a Likert Scale from strongly disagree to strongly agree.

1. Learning and Development interventions (formal and informal) in the organisation are aligned with the company's strategic objectives and goals

2. Learning and Development interventions (formal and informal) in the organisation are integrated through the organisation

3. Learning and Development interventions (formal and informal) are improving the professional competence (knowledge, skills and behaviours) of individual engineers in the company

4. The improvement of individual engineers' competence positively impacts on organisational performance

5. The company measures the impact of Learning and Development interventions on engineers' competence

6. The strategic objectives and goals of the company are communicated to the engineering cohort

7. The strategic objectives and goals of the company are understood by the engineering cohort

Creswell (2013) suggests that in qualitative research questions, a researcher should ask 'one or two central questions followed by no more than five to seven sub-questions' (Creswell, 2013, p.129). Creswell's suggestion that writing separate quantitative and qualitative questions 'highlights the importance of both the qualitative and quantitative phases of the study as well as their combined strength, and is thus the ideal approach' (Creswell, 2013, p.139). Qualitative questions for this study will include -

1. Do you align your L&D practices and interventions with the goals and objectives of the company, if so, how do you do it?
2. Are L&D practices and interventions integrated through the company?
3. Which L&D interventions have you found to be the most effective in developing the technical competences of engineers in the company?
4. Which L&D interventions have you found to be the most effective in developing the soft-skill competences of engineers in the company?
5. Do you evaluate the impact of L&D interventions on the competence of engineers, if so, how?
6. Do you communicate the strategic objectives of the organisation to individual engineers, if so, how?
7. Do you illicit feedback from engineers about their experience of L&D in the organisation, if so, how is it captured?
8. What has the feedback from engineers on L&D in the company been like to date?

# Chapter 2: Literature Review

## Strategic HRM and the resource-based view (RBV) of the firm:

Gooderham *et al.* (2008) note that among HR professionals and academics, Strategic HRM (SHRM) is generally used to signify the idea that HR practices should improve the performance of the employees in an organisation as well as the performance of the organisation itself, not least in terms of financial performance. They also note that the central precept of SHRM is the notion that people development improves organisational performance. The resource-based view (RBV) of the organisation suggests that internal knowledge and skills represent a distinct competitive advantage to firms and they should protect and develop these core competences thorough Learning and Development (Garavan, 2007; Lepak and Snell, 1999). Davenport, Prusak and Wilson (2003) argue that the creation of firm-specific knowledge and skills, when aligned with the strategic goals of the organisation can combine to enable the creation of additional, valuable knowledge and ensure sustained competitive advantage. Wright *et al.* (1994) in their study into Strategic HRM and RBV concluded that individual HRM interventions cannot provide competitive advantage on their own but may play a part in 'developing the sustained competitive advantage through the development of the human capital pool, and through moderating the relationship between this pool and sustained competitive advantage' (Wright *et al.*, 1994, p.318). Further and more contemporary support for this thesis comes from Jaing *et al.* (2012) whose research found that bundles of strategically aligned HRM 'bundles' had greater effect than individual HR practices or a series of isolated practices.

Finegold and Frenkel's (2006) investigation of Human Resource Management in Biotech companies is an example of an industry specific approach to HR/L&D in scientific, knowledge-driven, global organisations. Finegold and Frenkel's work echoes much of the recent academic literature in Strategic Human Resource Management by asserting that in an increasingly global and knowledge-driven economy, social and economic capital have superseded physical capital, financial capital and natural resources as a source of competitive advantage. They note that recent trends in science-based firms highlight the necessity to manage HR strategically, including strategies to move from discovery to getting products to market, utilising advancing technologies to impact on productivity and increasing the protection of intellectual property. While Finegold and Frenkel's work looks at a similar industry to that examined in this research, making useful observations and justifications for a strategic approach to HR management and the requirement to employ a HR Manager/HR Function, there is little focus on the role of L&D within the broader strategic HR management approach. According to Boxall and Purcell (2003), the managerial cohort of any organisation has a key role to play in the RBV

view of the organisation as they will be responsible for implementing HRM best practice and organisational performance may be dependent on their capability to do so.

Ireland, Hoskisson and Hitt (2009) describe strategic management as a process which involves the commitments, decisions and actions required for a company to gain competitive advantage in the market and earn above-average returns. Strategic competitiveness is said to be achieved when 'a firm successfully formulates and implements a value creating strategy', while strategic management is a 'continuing set of decisions and actions resulting in the formulation and implementation of strategies designed to achieve the objectives of an organisation' (Odiyo, 2013, p. 10). Ireland *et al.* (2009) note that strategic management is also a dynamic process, with organisations constantly needing to scan the horizon for upcoming opportunities and threats and adapting organisational structures and processes to fit market requirements. Tyson (2006) suggests that strategies do not result in once and for all type decisions; rather, they are iterative, with organisations learning from experience, noting that with the increased uncertainty in social, political and economic environments, planning horizons have generally shifted from 5 years down to 2 or 3.

The link between HR and Business strategy is succinctly described by Armstrong and Baron (2006), who suggest that the HR strategy of an organisation will depend on the needs, requirements and context of a given organisation. A division between the 'classical sequential approach' and the 'empirical needs-based approach' to strategic HRM has been distinguished by Armstrong and Baron (2007). The former, they argue, is characterised by a flow from the defined objectives of the organisation to the creation of a strategic plan and in turn the delivery of programmes to achieve the goals of the plan. The latter is, in turn, characterised by some similar elements to the 'classical sequential approach' but is less orderly and concentrates more on the periodical review of the implications of evolving business challenges.

Wright, Snell and Jacobsen (2004) have identified two approaches to the formulation of HR strategies, namely the 'inside-out' and the 'outside-in' approach. The inside-out approach looks at the existing HR function and attempts to link it to the business through specific initiatives, making minor adjustments where necessary, while the 'outside-in' HR approach looks at the business, its competitors and customers and then creates an integrated set of HR initiatives to align with business needs. Odiyo (2013) argues that for a strategic HR plan to be implemented and to have a positive effect, the 'HR Triad' of HR Professionals, Line Managers and employees affected by HR policies and practices will need to be involved. Jackson and Schuler (2001) suggest that there are clear responsibilities for each of these groups in the creation of a HR strategy that is aligned and integrated with the business strategy. Line managers, they contend, are responsible for communicating the

vision, mission and values of the organisation to employees and must work in conjunction with HR professionals to determine the competences required to implement the organisation's strategy. HR professionals are tasked with aligning the HR policies and practices with the goals and objectives of the organisation, collaborating with line managers to ensure that the competences being developed by employees are suitable for the organisation in achieving its goals and objectives. Finally, they suggest that employees should focus on contributing to the organisation's goals and objectives and where appropriate adjusting their behaviours and skills to align with those needed to implement the strategic objectives.

Jackson and Schuler (2001) also suggest that the integration of a HR strategy through the interaction of the 'HR Triad' will aid with integrating the strategy and build trust across the organisation. This is further corroborated by Tyson (2006), who argues that regardless of how comprehensive the HR planning process is, unless it is fully integrated to all areas of the organisation's strategy, it is unlikely to be meaningful and in turn effective. Azmi (2011) highlights the fact that Strategic HRM is not without its shortcomings, pointing to the fact that the theoretical underpinnings of SHRM have not been sufficiently tested to demonstrate the uncontested reliability and validity of its assertions. She also points to the problems encountered by proponents of SHRM in isolating the exact variables that link strategic HRM to the performance of an organisation. Azmi (2011) gives a comprehensive overview of key SHRM texts, summarising that SHRM is largely concerned with integration and adaptation, with the aim of ensuring that HR practices are integrated with strategic objectives, and that HR policies are coherent and adopted by line managers in order to align internal practices to build employees' skills, knowledge and behaviours to achieve business objectives.

Singh *et al.* (2012) note that there is no consensus in terms of how to measure Organisational Performance (OP), with HRM-related outcomes such as absenteeism, commitment, retention or job satisfaction used in some literature, while the majority of research has focussed on financial measures, with net profit used more often than not. Debate exists in the literature as to whether HRM practices such as Learning and Development have a direct effect on OP or whether it is indirect. Advocates of the direct effect (e.g. Chand and Katou, 2007, Pfeffer, 1994) posit that 'best practices' that are applicable at all times and in all places can improve OP. However, as demonstrated by Guest (2011) there is little agreement as to what these practices are, the number of practices and if the underlying meaning of the practices are the same from one organisation to the next. The 'indirect effect' line of research as exemplified by Paauwe (2009) and Wood and de Menezes (2008) argues that HRM practices only impact on OP indirectly. Singh *et al.* (2012) summarise that this has been termed the 'black box' of HRM-performance research as researchers have sought to emphasise suitable mediating

variables and the effect of HRM interventions on OP. Singh *et al.* (2012) also noted that researchers have found it difficult to find an effective HRM-performance link and there is no established method to demonstrate the (indirect) effect of HRM practices on OP. Boxall *et al.* (2016) argue that if researchers are to undertake effective studies of the effect of HRM/L&D interventions on organisational and individual effectiveness there is a requirement to choose the most suitable respondent for each variable in the study. Furthermore, they note that 'variables concerned with what is experienced in HRM must be reported by employees. The plain fact is that most of the psychological and social processes involved in HRM need to be assessed by employees themselves' (Boxall *et al.*, 2016, p.108).

Singh *et al.* (2012) highlight that in measuring the impact of HRM practices such as L&D on OP, two perspectives have dominated, namely the systems perspective and the strategic perspective. The former looks at the effects of HRM practices such as L&D interventions and how they contribute to competitive advantage for the organisation, the latter looks at the fit between HRM practices and the competitive strategy of the organisation and how these practices develop skills, knowledge and motivation to enable individuals to support organisational strategy. Singh *et al.* (2012) note that more recently, two competing perspectives have come to the forefront in terms of explaining the impact of HRM practices on OP, in the form of the Contingency View and the Resource Based View. The Contingency View posits that OP will be contingent on contextual factors such as the industry, political system, firm size etc. while the Resource Based View suggests that HRM practices contribute to OP through leveraging discretionary effort, leveraging human capital and encouraging desired behaviours and attitudes. This research will adopt a Resource Based View as exemplified by Hamel and Prahalad's (1994) work, which suggests a starting point to understanding competitive advantage is the company's internal resources, such as employee competence. They argue that in order to leverage these internal resources an organisation will have a consistent requirement for talent development and a permanent state of Learning and Development. The Resource Based View of competitive strategy, as summarised by Stewart and Rigg (2011), posits that the contribution of L&D is central to developing individual skills and influencing organisation routines and behaviours, from induction through to performance management. The RBV of the firm as advocated by Barney (1986, 1991) recommends that HR systems are aligned and integrated with the strategy of the organisation to deliver competitive advantage. Huselid, Jackson and Schuler (1997) further developed this theory by suggesting that technical HR activities to select employees with certain attributes and to train and develop them in line with the organisation's objectives and values can act as a value proposition for the HR function of the organisation and make the Human Resources of the organisation inimitable. Barney and Clark (2007) suggest that RBV requires an organisation to look at what attributes the organisation currently has

that are distinct and can be advantageous in comparison to competitors (including its people); these resources should be valuable, rare, inimitable (i.e. hard for competitors to replicate) and non-substitutable. Taylor (2014) takes up this point and notes that where a particular knowledge base provides a key source of competitive advantage, there will be an imperative to foster and develop this knowledge base. It should be noted that academics adopting RBV models such as Dany *et al.* (2008) have found that the integration of HRM practices into strategic decision making was a required, but not sufficient, condition for impacting on organisational performance. Dany *et al.* (2008) provide a useful summation of the RBV view by noting that the RBV perspective avoids the recommendation of adopting specific HR practices that will be applicable in all circumstances but rather looks at the broader question of developing resources within the organisation that can provide competitive advantage. Limitations of the RBV view have been noted by Bowen and Ostroff (2004), who suggest that investigation into the conditions of the implementation of the RBV view has been limited in empirical terms to date.

## Alignment:

Garavan (2007) describes Strategic HRM (SHRM) as a 'coherent, vertically aligned and horizontally integrated set of Learning and Development activities which contribute to the achievement of strategic goals' (Garavan, 2007, P. 25). Zula and Chermack (2007) argue that in order for HR professionals to positively impact on organisational outcomes and performance they must work in tandem with Senior Managers to create and implement learning policies and practices that fit with other systems in the organisation to develop human capital assets. Bowen and Ostroff (2004) found that alignment is considered desirable as it more likely to create shared meaning within an organisation and if HR practices align with organisational goals and person-organisation fit is tight, then employees are more likely to demonstrate commitment to the organisation and its goals and objectives. Anderson (2009) summarises the importance afforded in the academic literature to integration and alignment when she highlights the need for organisations to achieve a 'fit' between the strategic direction of an organisation (vertical alignment) and the imperative to achieve internal alignment for the different functions of the organisation (horizontal integration), wherein HRM plays a key role in human capital efficiency, strategic differentiation and economic outcomes. Her (2009) work also concluded that alignment is an iterative process in which different stakeholders within the organisation are in continuing dialogue around organisational and business planning processes, the use of benchmarking and organisational metrics. A common theme in the SHRM literature relating to L&D and alignment focuses on the relationship between Learning and Development, resource

maximisation and productivity, with the development of core competences in the organisation acting as the intermediate variable linking the other two variables (L&D and Resource maximisation/productivity) (Clardy 2008; Garavan, McGuire and O'Donnell 2004). It is also argued in the literature that a key element of vertical alignment is the opportunity for the HR function to identify and inform key strategic processes (including L&D) in order to develop core competences, achieve return on investment (ROI) and contribute to competitive advantage for the organisation (Clardy 2008; Zula and Chermack 2007). The concept of alignment has been contested by a number of academics, namely around the notion of whether alignment should be viewed as a process or an outcome. Wognum (2001), for instance, posits that in order to achieve desired outcomes through alignment, there should be a three-step process. These three steps include the identification of needs analysis of the HR implications of these needs and the strategic choices about investment in HR practices to meet these needs. The characterisation of alignment as a dynamic process is perhaps typified by Avison *et al.* (2004) who suggest that alignment involves continuous interaction between organisational actors and their values in a complex network of communication and understanding. Kepnes and Delery (2007) argue that alignment can be said to be in existence when there is a link between organisational goals/objectives and HRM coupled with employee commitment and allegiance to organisational goals. Avison *et al.* (2004) also posit that it is necessary for organisations to be flexible in their approach to alignment and to imbed a 'fitness' approach allowing employees to learn and adapt to changing circumstances and requirements. This academic position is reinforced by industry focussed research carried out by the Chartered Institute of Personnel and Development (CIPD) which found that 'L&D must be able to shape organisational direction; however, once a new strategic direction has been set, it must be able to change and align its processes with the new direction' (CIPD, 2014, p. 15).

Stewart and Rigg (2011) found two key implications for the alignment and design of Learning and Development interventions, following on from the recognition that different stakeholders will be involved in and have potentially contrasting expectations of how said interventions will deliver strategic results. The first implication is that objective setting encompasses not just the L&D/HR function but also line managers and potentially other stakeholders; in other words, objective setting is essentially collaborative. Secondly, they found that evaluation criteria and methods should be considered at the planning and design stage in order to highlight where real value can be generated. Six other factors were considered to be of significance by Stewart and Rigg (2011) in terms of developing a best practice approach the alignment of L&D practices. These factors are learners, organisation context, resources, combination of learning methods and interventions, transfer and application to work and deliver capability.

Garavan (2007) highlights a number of key assumptions and implications for the alignment of SHRM, these include that a mission statement should exist to align commitment between learning and organisational objectives with interventions explicitly linked to strategy. He also posits that Senior Management in organisations need to be constantly horizon scanning to ensure that strategic objectives are timely and accurate, while L&D/HR specialists are charged with understanding these objectives and using this understanding to inform the alignment of L&D interventions to strategy. He argues that HR/L&D interventions are not a panacea to all organisational challenges but it should provide a useful approach to developing the knowledge, skills and attitudes (competence) of employees. In turn, HR/L&D specialists need to employ suitable learning interventions to meet the needs of individual employees, while employees have a responsibility to evaluate their own skills and development needs.

Kepes and Delery (2007) propose that internally aligned HRM practices form powerful connections creating synergistic effects and organisational outcomes, while also noting that in order to garner these positive effects an organisation should recognise that HRM practices are interrelated and no single HRM initiative is likely to have an impact on its own. Kepes and Delery (2007) also found that two key factors should be taken into consideration when seeking to create internally aligned policies and practices reflecting the philosophy of the organisation. First, HRM should be appropriate for the organisation's competitive strategy in order to help the organisation achieve its goals and, second, for HRM systems to remain effective over time organisations must remain flexible and adjust to internal and external forces. This is reinforced by the findings of Boxall and Purcell (2003), who suggest that changes in a firm's strategy, workforce or environment should precipitate a moderation of the firm's HRM systems. They suggest that the need to adapt to the perennial tension between balancing consistent HRM practices that are allowed time to be embedded in an organisation and provide organisational and competitive advantages, while maintaining the requisite flexibility and agility to react to environmental challenges is essential for long term alignment and organisational success.

Collings (2014) argues that there are three key axes of alignment that organisations should seek to foster in order to encourage a sustainable relationship between individuals and the organisation itself. The first axis is 'capabilities alignment', wherein an organisation identifies key roles and ensures the capabilities of the individual match those of the organisation and vice versa. The second axis is 'commitment alignment', which seeks to align the commitment between employees and their employers. The final axis outlined is 'contribution alignment', which looks at the return on investment employers and employees believe they will gain from the development of their capabilities. Boxall (2013) argues that it is important for organisations to ensure employee contribution is achieved

through behaviours aligned with the values and strategy of the organisation, while employees' contribution is often dependent on their perception of the fairness of rewards and other benefits relative to their contribution to the organisation.

## Integration:

Garavan (2007) proposed a prescriptive model of SHRM that included the integration of HRD activities including L&D with the organisation mission and goals, the involvement of line managers in designing and delivering HRD interventions and implementing HRD activities that compliment and reinforce the contribution of HRD in the organisation. Anderson (2009), in summarising the literature on horizontal integration (Kim and Cervero, 2007; Garavan, 2007, Gubbins *et al.* 2006), posits that horizontal integration provides an opportunity for HR professionals and Senior Management to share strategic knowledge and information and in turn to direct, support and guide appropriate action in relation to Learning and Development. Zula and Chernack (2007) note that the strategic imperative towards vertical integration is predicated on a 'managerialist' approach, wherein HR/L&D is viewed as part of a chain of human capital initiatives, strategic thrusts and economic objectives. They postulate that horizontal integration is achieved when organisations internally integrate HRD practices and policies (including L&D) between the different functional sectors of the organisation. Marchington *et al.* (2011) argue that integration requires connected HR policies both between and within HR policy areas, with these HR policy areas often referred to as 'bundles'. Kepnes and Delery (2007) posit that integrated bundles of HRM practices reinforce the organisational message throughout the organisation, allowing for the avoidance of mixed messages and creating a coherent narrative around the aims and objectives of HRM interventions. Benson and Lawler's (2003) research found that high levels of integration should promote synergies across the organisation and improve organisational effectiveness. Bowen and Ostroff (2004) suggest that integration of HRM practices, such as Learning and Development, is important in creating complementary bundles of practices which promote high commitment among employees. Meyer and Allen (1997) found a positive correlation between employee commitment and motivation and positive learning experiences.

Marchington and Wilkinson (2008) are at pains to stress that integration is not a seamless process without challenges and hurdles to overcome in integrating HRM practices and procedures. They note a wide acceptance in academic literature that the failure of line managers to implement HRM in accordance with the intentions of Senior Management can lead to variations in HR practices. A number of reasons for the pervasiveness of this challenge have been expounded, including variations in the ability and skills of line managers, conflicting demands in terms of delivering HR based measures

versus more visible operational targets and aversion towards what are viewed as 'soft' HR initiatives (Purcell and Hutchinson, 2006; Khilji and Wang, 2006). Jackson and Schuler (2003) propose that HRD and HRM practices that are horizontally integrated can provide synergies and contribute to a defined set of behaviours and performance expectations. Guest and Peccei (2006) suggest that in addition to horizontal integration there is a requirement for functional and process integration, focussing on the quality of specialists within an organisation, where they are located within the organisation and the delivery processes by the organisation.

The concepts of alignment and integration are not uncontested and it has been suggested they contain a certain level of ambiguity. Francis and Keegan (2006) note the concepts of alignment and integration are predicated on the existence and clear communication of an overall business strategy, which may not always be present. It has also been argued that alignment and integration may reduce strategic capability, as tying HRM initiatives to a set strategic course or plan can reduce the adaptability of the organisation and employees to learn and change (Beer *et al.*, 2005). Debate has also taken place in the academic literature as to whether alignment and integration should be viewed as a 'process' or a 'result' (Anderson 2009, Avison *et al.* 2004). Guerra-Lopez and Hicks (2017) convincingly argue that organisations do not strive for perfect alignment, but rather engage processes that facilitate ongoing alignment, which requires keeping pace with changes in strategic priorities through different employee behaviours, skills and knowledge. For the purpose of this research we will view alignment and integration as a 'dynamic process involving interactions between organisational actors, networks and values, as well as a communication and understanding processes' (Anderson, 2009, p. 265). Anderson (2007) found that alignment and integration can mean different things to different stakeholders, depending on their strategic priorities. It can mean anything from short-term capability and financial results, to less tangible, longer term organisational outcomes. She concludes that an organisation's L&D function has three key opportunities for alignment and integration. These are namely involvement in business planning, proactive articulation of value or business case and the management of investment in Learning and Development infrastructure (Anderson, 2007, p.21).

## Competence Development and its effect on organisational performance:

Whiddett and Hollyforde (2003) provide a useful working definition of competences, describing them as 'behaviours that individuals demonstrate when undertaking job-relevant tasks effectively within an organisational context' (Whiddett and Hollyforde, 2003, p.5). Woodruffe (1993) differentiates between 'competency' and 'competence' by noting that the former describes the measurable skills and behaviours of individual employees, while the latter includes job function and the skills and

behaviours of employees that underpin performance. Chen and Naquin (2006) expand this definition, describing competence as 'the underlying individual work-related characteristics (e.g. skills, knowledge, attitudes, beliefs, motives and traits) that enable successful job performance.... in keeping with the organisation's strategic functions (e.g. vision, mission, uniqueness, future orientation, success or survival) (Chen and Naquin, 2006, p. 266).

Hutchinson (2013) relays survey based results from the United States that find that competences have been found to support the organisation in its mission and objectives and the biggest impediments to implementing competence based development in organisations are: lack of knowledge on how competences work, support and buy-in issues and resistance by line managers to their use. McGuire *et al.* (2008) found that Learning and Development can improve the competence of individuals in terms of their motivation, skills and self-awareness and as organisations become more knowledge driven (as is the case in the Medtech sector) L&D will play a more important role in meeting the learning needs of individuals and meeting organisational strategic objectives. Wright (2009) highlights that professions such as engineering have increasingly sought to improve the level of professional competence and accountability with the onus more and more on individual engineers to verify their competence in an observable way. She also notes that competence development is dependent on the context in which a professional is being developed and their understanding of that context. Subramony (2009) demonstrates that HRM bundles, such as L&D interventions, are more effective than individual best practices in improving firm performance and that employees' Knowledge, Skills, Abilities and Other characteristics (KSAOs), collectively termed as competences, can be enhanced through structured and validated procedures along with on-the-job training. Furthermore, he found that competences which were improved in line with 'organisational fit' resulted in a lower rate of employee turnover and improved unit performance. Aggregate levels of KSAOs were also found by Takeuchi *et al.* (2007) to be linked to improved performance at unit level within the organisation. Reid *et al.* (2004) differentiate between 'input' and 'outcomes' models of competency-based analysis. In their analysis, 'input' models focus on the behaviours displayed by individuals creating competent professionals, while 'outcomes' models focus on what is produced or created from competent performance. Gold and Iles (2010) expand on these models, arguing that the focus of 'input' models is primarily on individual characteristics and behaviour, including, but not restricted to KSAOs, while 'outcomes' based models look at the job itself and its requirements and required outcomes. They also note that competence or competency analysis is often accompanied by a competence framework, which can be used for a number of HRM interventions, namely: designing job specifications, leadership development programmes, performance management, succession planning and most importantly for this work, identifying and guiding L&D interventions. The purpose of competence development is

summarised by McDonnell *et al*. (2017), who suggest that it is looking at where talented professionals reside in the organisation, looking at how they create value and how competence development can maximise the impact of these individuals. Futhermore, Becton and Schraeder (2009) summarise that the capability of individuals to generate and deploy knowledge within an organisation is becoming a key differentiator to organisational performance and that individual competence must be developed not just to improve their ability to carry out their role but to achieve organisational strategic objectives.

Nel and Warner (2004) note that HRM and L&D are increasingly focussed on determining the impact of HR development initiatives in terms of adding value to the organisation, improving internal efficiencies and generating value for shareholders. Jayne (2002) posits that HR has moved from its traditional transactional functions such as performance assessment, payroll and recruitment towards a more strategic organisational role. Part of this role is looking to create a win-win partnership with employees in order to meet organisational goals and objectives; this has been characterised by increased deployment of learning interventions in the form of coaching and mentoring, leadership development and competence improvement. Brinkerhoff (2006) suggests that performance improvement has learning at its core and that a symbiotic relationship exists between the two, with learning enabling performance and performance enabling learning. Garcia (2005) found empirical support to suggest that Learning and Development can improve satisfaction at work, promote the understanding of the organisation's culture and aims among employees, increase employee participation and facilitate knowledge sharing. However, Giangreco, Sebastiano and Pecci (2009) found in their research that the perception of L&D within and among organisations varied from a panacea to all organisational problems, to a cost in both time and money. Hutchinson (2013) relays the results of Chartered Institute of Personnel and Development (CIPD) surveys into the perceived effectiveness of different L&D interventions in the workplace. It was found that the most popular L&D interventions among British practitioners were those that took place closest to the workplace, such as; In-house development programmes (52 per cent), coaching by line managers (46 per cent) and on-the-job training (29 per cent). The surveys also found that job rotation, job shadowing and secondments were rated as the most effective (23 per cent) while e-learning (11 per cent), external conferences and workshops (14 per cent) and formal education and courses (12 per cent) were rated the least effective.

Evaluation of effectiveness of L&D interventions:

Stewart and Rigg (2011) explain that in relation to Learning and Development evaluation is concerned with the results and outcomes flowing from the intervention. This can be expressed in economic terms as the Return on Investment (ROI) or, increasingly, is expressed in relation to the extent to which stakeholder expectations were met, termed Return on Expectations (ROE). With regard to evaluating the impact of L&D interventions, The Kirkpatrick Model (1975) has been the dominant model for evaluating L&D initiatives for many years. Winterton (2007) summarises the Kirkpatrick Model by highlighting the four different levels of evaluation. These levels are – 'Reaction level evaluation', which provides information on participants' feelings about the training; 'Learning level evaluation', which evaluates how effective the training has been in transferring skills and knowledge to employees; 'Behavioural level evaluation', which looks at how effectively the skills and behaviours attained through training have been deployed on the job and 'Results level evaluation', which evaluates the impact of training on cost savings, quality savings and improvements in work output. While the Kirkpatrick Model has been the most prominent mechanism, it is far from the only one. Other models include Warr *et al's* (1970) CIRO (Context, Inputs, Reactions, Outcomes) model, Pawson and Tilley's (1997) realistic evaluation CMO (Context, Methods, Outcomes) model and Kaplan and Norton's (1996) balanced scorecard. More recent innovations in terms of evaluation have been introduced by Robert O. Brinkerhoff, especially with 'The Success Case Method' (2003). This method involves using surveys to identify a sample of learners who have successfully transferred learning to the workplace and a sample of those who haven't transferred their learnings. The evaluation of surveys relies on qualitative explanations, with the hope that individual narratives within both groups will identify the strengths and weaknesses of learning interventions. The strength of this particular approach lies in its narrative explanation for other individual learners who may be able to identify with the experiences of their colleagues. However, the major weakness is the subjective nature of the experience and reasoning of individuals in explaining the application of learning and the anecdotal approach forgoes quantitative and empirical data in explaining why certain individuals are able to apply their learnings, while others are not.

Anderson's (2007, 2009) studies found four main approaches to judging the value of L&D. These four approaches are, first, 'efficiency measures of the Learning and Talent Development function' which assesses feedback from learners after the learning intervention and compares performance before and after the intervention. Second, Anderson's studies demonstrated that Senior Managers place a big emphasis on the impact of the learning intervention on Key Performance Indicators (KPIs) and internal metrics around productivity and performance. This evaluation mechanism was titled 'internal performance indicators and external benchmarks' and measures data and management feedback to demonstrate the extent to which employees are developing in line with the organisation's strategic

requirements. The third set of evaluation mechanisms are 'Return on Investment' (ROI) measures, which look at the ways that learning contributes to cost reduction or productivity increases that can be attributed to the learning intervention. Finally, 'Return on Expectation' (ROE) places more value on the strategic readiness of employees. This strategic readiness is evidenced through employees demonstrating expected behaviours after the learning intervention, especially the expectations of key stakeholders in the organisation. This research recognises the plethora of methodologies and criteria used to measure the impact of L&D interventions; however, it is beyond the scope of research to ascertain the superiority of one method over another. Rather, the awareness or employment of any of these methods or others will be investigated to gauge whether formalised systems are in place in Medtech organisations in Ireland.

## Communication of the goals and objectives of the organisation:

One of the key challenges identified by Hutchinson (2013) in fully aligning and integrating Learning and Development with the strategic goals and objectives of the organisation is ensuring clarity of communication when trying to translate L&D practices into coherent strategic outcomes. Beer and Eisenstat (2000) identified six factors they discovered that acted as impediments to the communication of the strategic objectives of the organisation and the alignment of Learning and Development. These include a laissez-faire or top-down approach to management; unclear or conflicting strategic priorities; lack of engagement with, or belief in, L&D on the part of Senior Management; poor vertical communication between different functions in the organisation; poor coordination of L&D across the organisation and inadequate skills or competence at leadership levels. It has also been highlighted by Hamel (2012) that a key challenge to aligning L&D to organisational goals and objectives comes from trying to communicate organisational strategy in real time while maintaining the flexibility required to meet market challenges. It has been recognised by Nishii *et al.* (2008) that employees perceptions of the purpose and rationale for HR and L&D interventions are as important as the actual practices themselves, while Bowen and Ostroff (2004) found that shared meaning cannot be created among employees unless all or almost all individuals are subject to and can perceive themselves to be subject to fair and transparent HR and L&D practices. Guest (2007) argues that in order for a functioning psychological contract between employer and employee to take root, the perception of fairness is of paramount importance and those organisations that struggle with aligning and integrating their HR/L&D policies are likely to be perceived by their employees as inconsistent. Russ (2004) suggests that academic literature on SHRM may be overly simplistic in suggesting that firms are consistent at all times and across the organisation in communicating the

strategic rationale and objectives of the organisation. He contends that organisations, in reality, have to deal with communicating strategically competing demands and that 'members of organisations are subject to a fantasy of control and coherence, supported and reinforced by both conscious and unconscious personal, group and organisational processes' (Vince, 2004, p. 10). Anderson (2009) also recognises that organisations are likely to face issues around reconciling long-term strategic objectives and short term imperatives and that alignment and integration are predicated on the clear communication of HR/L&D objectives and their link to strategic objectives. The communication between different functions within an organisation is highlighted as being of significant importance in aligning and integrating HR policies by Jhajharia and Kaur (2015), who suggest that the HR function plays and important role in mediating between the external business environment and the internal communication of strategic and development goals to employees.

# Chapter 3: Methodology

Methodologies used in previous literature:

A number of useful methodological approaches exist in the literature around L&D interventions, alignment and integration and competence development for professionals. Anderson (2009) grounded her research on the alignment of HRM processes in a constructivist-interpretivist paradigm which adopted a qualitative assessment of senior decision-makers in the UK. Semi-structured interviews were undertaken with Senior Managers and HRM Managers to gather data and examine the meaning attached to alignment and the impact of contextual factors. Face-to-face interviews were undertaken which were audio recorded and transcribed. 12 organisations took part and all transcripts were coded against a set of themes and qualitative data analysis software was employed to examine the findings. This approach was useful in informing this research proposal as it looked at the experience and interpretation of a common concept – 'alignment' among two separate functions in an organisation (Senior Executives and HR Managers). However, the difference in the methodological approach adopted by Anderson (2009) and this research is that the concept of alignment was more dependent on the subjective interpretation of the respondents, thus lending itself to a mixed method approach where the experiences of the three key cohorts of Engineering Managers, HR/L&D Managers and engineers are surveyed and interviewed. Also, Anderson's research was focussed on a much smaller sample group, namely Senior Staff Executives, while this research will focus on much larger sample groups.  As this research seeks to assess the impact of L&D interventions among a potentially large sample group, a mixed method approach was adopted, albeit the impact will be assessed by two separate functions in the organisations, specifically - the HR/L&D and Engineering functions. McGuire *et al.* (2008) focused on the impact of managers personal values on training and development. Questionnaire data was collected from 340 Irish and Canadian line managers in order to test the hypothesis that personal values would impact on the importance afforded to training and development. A three part questionnaire was used to profile the personal values of the participating line managers and, in turn, quantitative data was analysed using the Statistical Package for Social Sciences (SPSS, Version 15.0). This research will adopt a blend of these two methodological approaches, as it will focus on the perception of the impact of L&D by three separate groups (Engineering Managers, HR/L&D Managers and Engineers) in Medtech companies in Ireland, as well as the level of alignment and integration of the L&D initiatives and its perceived impact on individual competence and organisational performance.

There is a dearth of literature specifically related to HRM/L&D or even general management in the Medtech sector in Ireland. One of the few non-technical articles related to the area is McCormack *et al.'s* (2015) analysis of open innovation practices in the Medtech sector in Ireland. While the work usefully highlights the fact that the Medtech industry in Ireland is moving from a predominantly manufacturing environment to one driven by Research and Development and innovation, it is limited

in its academic scope. The limitations of McCormack *et al.'s* article is evidenced through its reliance on just 10 references, some of which are not from academic peer-reviewed journals. Methodological limitations of the work are apparent from the fact that the research focusses exclusively on the Galway Cluster of Medtech companies and therefore cannot be seen as representative of practices in Ireland as a whole. Equally, the focus on open innovation provides very little groundwork for this research on L&D.

A couple of useful meta-analyses on workplace learning (formal and informal) and talent management provided a useful overview of the theoretical approaches taken to understanding the intersection between learning at an individual and organisational level and how organisations implement talent development strategies and practices. The first meta-analysis by Manuti *et al.* (2015) investigates learning processes and the role they play in developing careers and organisational success, as well as the role of knowledge and experience in the acquisition and development of workplace competences. In line with much of the aforementioned literature, Manuti *et al.* summarise the findings of much research in the area of workplace learning by stating that it has the 'potential to link development of the individual with development of the organisation or business, through an emphasis on sustained development of learning processes as well as learning outcomes' (Manuti *et al.*, 2015, p. 2). This meta-analysis provides a good summary of the definitions and theoretical concepts around individual, organisational, workplace, informal, non-formal, implicit, deliberative and reactive learning and points to studies such as Govaerts *et al.* (2010) which demonstrate a positive relationship between learning and talent retention and Jacobs and Parks (2009) findings that the future of the knowledge economy will require individuals not just to work together as a teams but to learn as a team as well. However, the limitations Manuti *et al.* (2015) highlight that previous research in the area of workplace learning has been based on theoretical approaches rather than the practice of workplace learning in specific industries and workplaces. Equally, much of the research in the area of workplace learning has not examined what employees are learning for and measuring the impact of learning interventions. This research seeks to remedy this shortcoming by specifically looking at theoretical best practices from an academic setting and assessing whether it is being applied in a specific industry (the Medtech sector in Ireland) and whether workplace learning is improving the competence of a specific cohort of employees (engineers) and improving Organisational Performance.

McDonnell *et al.'s* (2017) meta-analysis of talent management scholarship suggests that 'the empirical settings and data collection methods and analysis are in need of significant improvement. While not seeking to downplay the value of the rich and informative research undertaken, it is quite apparent that small scale studies based on convenience sampling dominate' (McDonnell, 2017, p. 92).

Elucidating this criticism they highlight the fact that only 30 per cent of the papers reviewed used a theoretical framework in their research. This meta-analysis addresses some key concepts and contributions to talent management in recent years some of which provide useful frameworks for this research. Collings and Mellahi (2009) stress that Talent Management is not merely about the identification and development of talented staff, but rather that competitive advantage is derived from the systematic identification of key positions within the organisation which add differential value. This echoes the findings of Becker and Huselid (2006) who espoused the importance of role differentiation within organisations and between roles that provide marginal impact versus above-average impact. Developing this concept further and tacitly addressing the concepts of alignment and integration, Boxall and Purcell (2011) argue that human capital is only of genuine economic use if it is deployed in the implementation of the organisation's strategic intent. Perhaps a useful summation of recent literature can be found in Beechler and Woodward's assertion that 'great systems are often more important that great people' (Beechler and Woodward, 2009, p.277). McDonnell *et al.*'s (2017) meta-analysis gives a contemporary overview of the academic and theoretical approach to Talent Management and it is conceded that much of this academic work is purely theoretical and there is an existing practice gap. In terms of the broad methodological trends in measuring the impact of Talent Management Practices McDonnell *et al.* note that 'study participants are most commonly from the management (typically senior HR personnel or top management team) viewpoint. There are few studies which have incorporated the actual "talents"' (McDonnell *et al.*,2017, p.92). This research will seek to remedy this shortfall in the academic literature by specifically addressing the "talent's" experience of talent management practices.

## Methodological approach used in this research:

Johnson, Onwuegbuzie and Turner (2007) argue that mixed methods research can be a powerful means of extracting balanced, highly informative, exhaustive and useful research results. Equally, Maxwell and Loomis (2003) posit that mixed research methods can lead to new modes of thought by providing rich data through engaging multiple perspectives and capturing a greater range of perspectives than qualitative or quantitative methods alone, leading to research that is pluralistic, inclusive and complementary. It has been noted by Denscombe (2008) that mixed methods research is underpinned by a pragmatic philosophical approach focussed on a practical, outcomes orientated and needs based approach to research methods and concept selection. However, the mixed method approach to research is not uncontested, with the difference in the philosophical assumptions between Quantitative and Qualitative methodology highlighted as making them incompatible by

Denzin and Lincoln (2005), while Hesse-Biber (2010) suggests that mixed method research has 'leaned towards a more positivistic methodological orientation' (Hesse-Biber, 2010, p. 457). This is further corroborated by Molina-Azorin (2011) who reported in his study of 130 articles that used mixed methods, 80 per cent of them were dominated by quantitative elements. As noted by Krivokapic-Skoko and O'Neill (2011) these criticisms ignore that there is a variety of levels and methods to mixing qualitative and quantitative methods, from basic blending through to sophisticated integrative approaches. They suggest that the best mixed methods are designed to achieve both generalisation and deeper analytical insight, tending to blend approaches and gain something that would not be found by using one approach alone.

Park and Park (2016) suggest that scientific activity takes place in two separate contexts, namely, in the context of discovery and the context of justification. The former is generally applicable to the softer or social sciences where theories and hypotheses are created which are not as susceptible to logical, empirical analysis, while the latter can be more formally investigated and analysed using more rigorous testing based on replicability. Park and Park (2016) go on to suggest that these contexts manifest themselves through qualitative and quantitative methodologies, with qualitative methodologies broadly seeking to investigate various social events and quantitative methods seeking to measure, evaluate and generalise findings by testing hypotheses in controlled studies where replication of findings is a key aim. Furthermore, Park and Park (2016) note that both qualitative and quantitative researchers are selective in what they view as being of importance and as with all theoretical models, it is just that, an abstract model seeking to identify patterns in the real world. Qualitative research, they suggest, adopts a holistic approach that aims to create a 'thick' description of discovery with respondents providing meaning through discourse, while quantitative methods present questions based on theoretical models designed to yield results that can be statistically assessed for significance in order to explain underlying processes.

Gerhart (2013) stresses the importance that needs to be afforded to those who experience HRM, as they are best placed to assess their impact. He also notes a strong trend in HR research toward multi-source data, based on feedback from those best placed to evaluate the variables. Reflecting methodological best practice, the perceptions and experience of both the engineering and HR functions as to the alignment and integration of L&D interventions and their impact on individual professional competence development and organisational performance were investigated. Equally, Boxall *et al.* (2016) highlight the methodological prevalence of survey methods and quantitative analytical techniques when examining the impact of mediating variables on organisational

performance. A cross-sectional research strategy was adopted for this research, due to time and financial constraints. Cross-sectional research, as Anderson (2016) explains, collects data in a standardised form from groups of people at a single point in time. She also notes that it is often referred to as the 'survey method' as it usually seeks to obtain information through postal, telephone or web-based/emailed questionnaires with a sampling technique that provides an accurate reflection of the broader population.

As the research will focus on three sub-groups or functions within Medtech companies, stratified sampling selection methods were used. Anderson (2016) points out that stratified sampling is most appropriate when looking at sub-populations within organisations and, in turn, random samples are drawn from these sub-populations. She also notes that when one of the sub-groups is quite small (as will be the case with the HR/L&D function within Medtech companies), simple random sampling or stratified sampling can overlook them. Once the sample group was established, an online/web-based questionnaire (using Survey Gizmo) was administered to the sample population. Medway and Fulton (2012) in their meta-analysis of survey response rates summarise earlier research, reporting that web-based surveys and questionnaires are the most practical form of obtaining questionnaire and survey data as they are self-administered, low in cost, timely in terms of data collection and allow checks in range and skip patterns.

The questionnaires were designed using ordinal scale data. The questionnaires adopted a 5-point Likert scale, separately asking the Engineers, Engineering Managers and the HR/L&D Managers the same questions. The respondents were asked to rate the extent to which they agree or disagree with the following statements:

1. Learning and Development interventions (formal and informal) in the organisation are aligned with the company's strategic objectives and goals
2. Learning and Development interventions (formal and informal) in the organisation are integrated through the organisation
3. Learning and Development interventions (formal and informal) are improving the professional competence (knowledge, skills and behaviours) of individual engineers in the company
4. The improvement of individual engineers' competence positively impacts on organisational performance
5. The company measures the impact of Learning and Development interventions on engineers' competence
6. The strategic objectives and goals of the company are communicated to the engineering cohort

7. The strategic objectives and goals of the company are understood by the engineering cohort

An 8th question – 'Is there any feedback you would like to give on how Learning and Development is delivered in your organisation?' was included to capture some qualitative feedback from the engineering cohort. Neuman (2011) provides useful guidelines on sampling ratio size, highlighting that the bigger the population, the bigger the sample ratio size should be investigated. Reflecting this principle, this research will draw a sample population from across approximately 10 large Medtech companies based in Ireland, sampling a minimum of 1 HR/L&D Manager and 1 Engineering Manager respondent to 6 Engineers, reflecting the numbers employed in these functions. The relatively small numbers of HR/L&D professionals employed in Medtech companies compared to engineers, means that a purposive sample was taken. Anderson (2016) notes that purposive sampling is useful for capturing the perspective of those with specialist experience or knowledge in a given field, which will apply to the HR/L&D Manager and Engineering Manager sub group of respondents.

Once the questionnaire responses were collected, a code was be assigned to identify the questionnaire response, but not the individual. This created a Statistical Package for the Social Sciences (SPSS) data worksheet for the quantitative analysis of the data. SPSS was employed to demonstrate a number of descriptive statistics around the responses, for instance using cross tabulations to comparte the perceptions of HR/L&D Managers, Engineering Mangers and Engineers. This was undertaken to measure the feelings between the key roles outlined in aforementioned literature about the roles of HR, line managers and those that are the subjects of L&D interventions. Going beyond simplistic descriptive statistics, a number of tests were undertaken to measure the normality of the responses in order to ascertain whether the data was parametric or non-parametric. Anderson (2016) describes the difference between parametric and non-parametric data  by highlighting that parametric are used when the statistics are normally distributed and usually used with numerical data, whereas non-parametric data is when it is not normally distributed and is often used with categorical data. Pallant (2016) highlights that the word 'parametric' derives from the word parameter and relates to the sample being characteristic of the population, while non-parametric data cannot make such claims, making non-parametric tests are less sensitive and less powerful than their parametric counterparts. Once it was established that the data was non-parametric and there were more than two groups being investigated, a Kruskal-Wallis test was undertaken to see whether there was variance between the HR Manager, Engineering Manager and engineering groups. Pallant (2016) explains that the Kruskal-Wallis test allows a researcher to compare scores on a continuous variable.

The qualitative element of the mixed methods approach involved a purposive sample of Engineering Managers and HR/L&D Managers from the 10 organisations that agreed to take part in the research.

Semi-structured interviews were conducted with 9 respondents. These interviews were conducted over the course of a month with explicit consent garnered from all participants to record and transcribe the interviews. Due to the geographical dispersion, time and cost considerations all interviews were conducted by phone. The questions were designed to elucidate the information gathered in the quantitative surveys and sought deeper insight into the approach taken to the alignment and integration of L&D in developing the competence of engineers working in the Medtech sector in Ireland. The questions asked to all interviewees were

1. Do you align your L&D practices and interventions with the goals and objectives of the company, if so, how do you do it?
2. Are L&D practices and interventions integrated through the company?
3. Which L&D interventions have you found to be the most effective in developing the technical competences of engineers in the company?
4. Which L&D interventions have you found to be the most effective in developing the soft-skill competences of engineers in the company?
5. Do you evaluate the impact of L&D interventions on the competence of engineers, if so, how?
6. Do you communicate the strategic objectives of the organisation to individual engineers, if so, how?
7. Do you illicit feedback from Engineers about their experience of L&D in the organisation, if so, how is it captured?
8. What has the feedback from engineers on L&D in the company been like to date?

The names of the organisations involved in the research have been redacted but a brief description of them can be found below and will be referred to as Company 1, 2 etc. through the rest of the research. The names of the interviewees were also redacted but the job title and the company they work for is included below as well.

**Company 1** – Cork-based subsidiary of one of the world's largest and most diverse healthcare corporations. The company offers a broad portfolio of orthopaedic and neuro products for joint reconstruction, trauma, spine, sports medicine, neurological, craniomaxillofacial, power tools and biomaterials.

**Company 2** – Galway-based medical device company specialising in the design, manufacture & commercialisation of aerosol drug delivery systems.

**Company 3** – Cork and Limerick-based manufacturer of hip and knee system implants, bone cement and bone substitutes, surgical blades and micro-rotary burs which are used for cutting, drilling, burring and shaping bone and soft tissue during orthopaedic, spine, ear, nose and throat plastic surgery.

**Company 4** – Drogheda-based global Medtech company dealing with infectious disease and cancer, medication management, infection prevention, equipping surgical and interventional procedures and the management of diabetes.

**Company 5** – Clonmel-based worldwide developer, manufacturer and marketer of medical devices whose products are used in a broad range of interventional medical specialties. The site in question specialises in the Development, Manufacture and Distribution of Implantable Pacemakers and Defibrillators for the Cardiac Rhythm Management business.

**Company 6** – Athlone-based global wound care and regenerative medicine company focused on advanced wound therapeutics and regenerative medicine. It develops and commercialises innovative healing solutions, including negative pressure wound therapy, advanced dressings, negative pressure surgical management and epidermal harvesting.

**Company 7** – Bray and Waterford-based Medtech company focussed on the development and manufacture of complex high-growth inhalation and injectable drug delivery devices.

**Company 8** – Dublin-based Medtech company manufacturing complex medical diagnostics analysers for a worldwide market. Along with development and production activities the company is also involved in the refurbishment and supply of spare parts during the product life cycle.

**Company 9** – Shannon-based global Medtech company specialising in joint replacement solutions for knee and hip pain, providing comprehensive spine care solutions for acute and chronic back pain

**Company 10** – Limerick-based subsidiary of global Medical Devices and Diagnostics business manufacturing contact lenses.

**HR Manager Respondents:**

**Interviewee A** - HR Business Partner – Company 9
**Interviewee B** - HR Business Partner – Company 8
**Interviewee C** - Senior Learning and Development Specialist – Company 5
**Interviewee D** - Director Global Learning Solutions - Company 1

**Engineering Manager Respondents:**

**Interviewee E** - Operations Manager Manufacturing/Operations Management – Company 4
**Interviewee F** - Head of New Product Introduction  -  Company 8
**Interviewee G** - Advanced Operations Engineer – NPI – Company 3
**Interviewee H** - Materials Engineering Program Manager - Company 1
**Interviewee I** - Director of R&D – Company 2

# Chapter 4: Findings/Results

**Q.1 Learning and Development interventions (formal and informal) in the organisation are aligned with the company's strategic objectives and goals**

**Fig.1**



4. Learning and Development interventions (formal and informal) in the organisation are aligned with the company's strategic objectives and goals
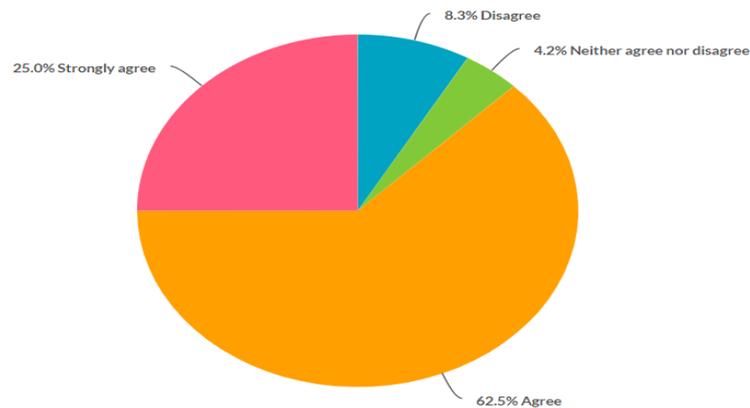
| Value | | Percent | Responses |
|---|---|---|---|
| Disagree | | 8.3% | 4 |
| Neither agree nor disagree | | 4.2% | 2 |
| Agree | | 62.5% | 30 |
| Strongly agree | | 25.0% | 12 |
| | | | Totals: 48 |

At the most basic level of statistical analysis for question 1, as per the pie chart presented in Fig. 1 we can see that the breakdown for all respondents without any reference to the respondent group or any difference between the groups. The level of agreements is quite high with 62.5 per cent and 25 per cent of all respondents either agreeing or strongly agreeing with the statement that L&D interventions are aligned with organisational goals and objectives. This is corroborated within the qualitative interviews, with all but one of the interviewees suggesting that there are positive attempts made to align L&D with the goals and objectives of the company.

**Reliability**

**Fig. 2**

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 46 | 95.8 |
| | Excluded[a] | 2 | 4.2 |
| | Total | 48 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Fig. 3**

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .814 | 7 |

Drilling down deeper into the results of the survey data and checking the reliability of the scales Fig. 2 and 3 were generated. Highlighted is the Cronbach's Alpha coefficient of .814. DeVillis (2012) found that ideally the Cronbach's Alpha coefficient for a scale should be above .7 and preferably above .8. As the Cronbach's Alpha is .814 we can accept the reliability of the scale.

## Descriptive statistics

**Fig. 4 Cross Tabs**

**Q1 * Job Title general Crosstabulation**

Count

| | | Job Title general | | | Total |
|---|---|---|---|---|---|
| | | Engineering Manager | HR Manager | Engineer | |
| Q1 | Disagree | 2 | 0 | 2 | 4 |
| | Neither agree nor disagree | 1 | 0 | 1 | 2 |
| | Agree | 1 | 3 | 26 | 30 |
| | Strongly agree | 2 | 3 | 7 | 12 |
| Total | | 6 | 6 | 36 | 48 |

**Graph/Bar Chart**

**Fig. 5**
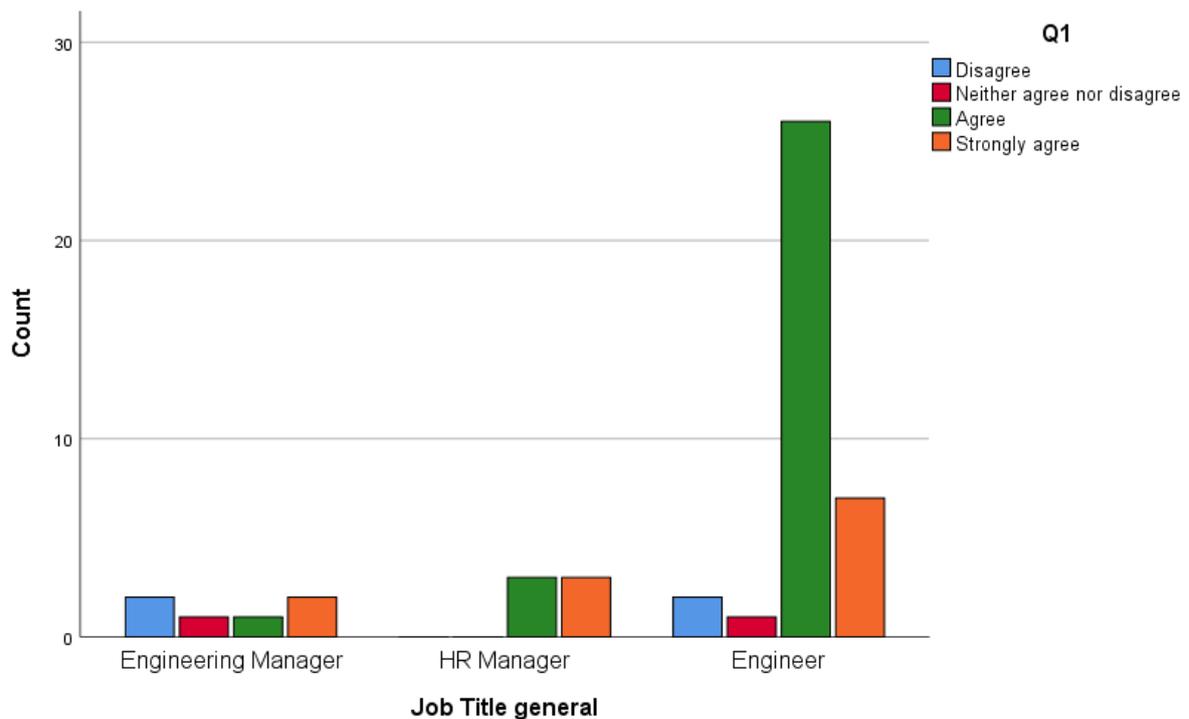


Using SPSS to generate cross-tabulations and plotting the results of surveys on a bar chart, as visible in figures 4 and 5 we can see that the is some observable difference between the two engineering groups and the HR/LD Manager groups. All six of the HR/L&D Managers either agreed or strongly agreed with the statement 'Learning and Development interventions (formal and informal) in the organisation are aligned with the company's strategic objectives and goals', while two of the Engineering Mangers and two Engineers also disagreed with the statement. This is supported through the interviews with the Engineering Managers. In answer to the first qualitative question, when asked if L&D practices were aligned with the goals and objectives of the company, Interviewee I responded "Not formally across the board. We wouldn't have very strong L&D programme within the company. It is intended that we would get to that", while Interviewee E noted "Not consciously or methodically, there are ad hoc things that go on"

**Fig. 6**

**Descriptives**

| | Job Title general | | | Statistic | Std. Error |
|---|---|---|---|---|---|
| Q1 | Engineering Manager | Mean | | 3.5000 | .56273 |
| | | 95% Confidence Interval for Mean | Lower Bound | 2.0535 | |
| | | | Upper Bound | 4.9465 | |
| | | 5% Trimmed Mean | | 3.5000 | |
| | | Median | | 3.5000 | |
| | | Variance | | 1.900 | |
| | | Std. Deviation | | 1.37840 | |
| | | Minimum | | 2.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 3.00 | |
| | | Interquartile Range | | 3.00 | |
| | | Skewness | | .000 | .845 |
| | | Kurtosis | | -2.299 | 1.741 |
| | HR Manager | Mean | | 4.6000 | .24495 |
| | | 95% Confidence Interval for Mean | Lower Bound | 3.9199 | |
| | | | Upper Bound | 5.2801 | |
| | | 5% Trimmed Mean | | 4.6111 | |
| | | Median | | 5.0000 | |
| | | Variance | | .300 | |
| | | Std. Deviation | | .54772 | |
| | | Minimum | | 4.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 1.00 | |
| | | Interquartile Range | | 1.00 | |
| | | Skewness | | -.609 | .913 |
| | | Kurtosis | | -3.333 | 2.000 |
| | Engineer | Mean | | 4.0571 | .11554 |
| | | 95% Confidence Interval for Mean | Lower Bound | 3.8223 | |
| | | | Upper Bound | 4.2919 | |
| | | 5% Trimmed Mean | | 4.1190 | |
| | | Median | | 4.0000 | |
| | | Variance | | .467 | |
| | | Std. Deviation | | .68354 | |

| | | |
|---|---|---|
| Minimum | 2.00 | |
| Maximum | 5.00 | |
| Range | 3.00 | |
| Interquartile Range | .00 | |
| Skewness | -1.243 | .398 |
| Kurtosis | 3.564 | .778 |

**Fig. 7**

**Tests of Normality**

| | Job Title general | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Q1 | Engineering Manager | .195 | 6 | .200[*] | .861 | 6 | .191 |
| | HR Manager | .367 | 5 | .026 | .684 | 5 | .006 |
| | Engineer | .381 | 35 | .000 | .676 | 35 | .000 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As displayed in Figures 6 and 7 tests of Normality were undertaken. Pallant (2016) explains that 'Normal is used to describe a symmetrical, bell shaped curve, which has the greatest frequency of scores in the middle with smaller frequencies toward the extremes' (Pallant, 2016, p. 59). Pallant (2016) notes that in the Kolmogorov-Smirnov statistic a non-significant result (a Sig. value of more than 0.05 indicates normality, as the sig value is under for 0.05 for two of the groups, an assumption of non-normality can be assumed. Anderson (2016) notes that an academic debate exists as to whether the mean can be used with ordinal data and that strictly speaking the median should only be used. This is due to the fact that we cannot be certain that the gap between, for instance, in our 5 point Likert scale that the difference between 'Disagree' and 'Agree' is the same as the difference between 'Neither agree nor disagree' and 'Strongly Agree', both of which are within two points on the 5 point Likert scale. We can report median values of 3.5 (between 'neither agree nor disagree' and 'Agree') for Engineering Managers, 4.0 ('Agree') for Engineers and 5.0 ('Strongly Agree') for HR/L&D Managers. Anderson (2016) highlights that if a researcher is 'planning to analyse nominal or ordinal data, you will need to make use of non-parametric tests. Second, is your data normally distributed? If the spread of the data across the extremes does not reflect a normal curve of distribution, again, you should use non-parametric tests.' (Anderson, 2016, p.346).

**Kruskal-Wallis Test**

**Fig. 8**

**Ranks**

| | Job Title general | N | Mean Rank |
|---|---|---|---|
| Q1 | Engineering Manager | 6 | 19.50 |
| | HR Manager | 6 | 32.00 |
| | Engineer | 36 | 24.08 |
| | Total | 48 | |

**Fig. 9**

**Test Statistics[a,b]**

| | Q1 |
|---|---|
| Kruskal-Wallis H | 3.405 |
| df | 2 |
| Asymp. Sig. | .182 |

a. Kruskal Wallis Test

b. Grouping Variable: Job Title general

Having noted that non-parametric statistics are most suitable for the data collected as it both ordinal and non-normally distributed a Kruskal-Wallis Test was undertaken with the results presented in Figues 8 and 9. A Kruskal-Wallis allows a researcher to investigate between three or more groups along a continuous variable. In this case it is the variance in the belief that L&D is aligned to the goals and objectives of the company for the three respondent groups. Pallant (2016) notes that the key piece of information to be extracted from this test is the significance level (presented as Asymp. Sig.) and that if the significance level is less than .05 then you can conclude that there is a significant statistical difference in the continuous variable across the three groups. As the Asymp. Sig is greater than .05 at .182, then we cannot assume there to be statistical variance between the three groups.

**Oneway ANOVA**

**Fig. 10**

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Q1 | Between Groups | 3.028 | 2 | 1.514 | 2.534 | .091 |
| | Within Groups | 26.889 | 45 | .598 | | |
| | Total | 29.917 | 47 | | | |

As noted earlier we are dealing with non-parametric statistics due to the fact that the continuous variables as measured along a 5 point Likert scale is an ordinal measurement. However, as there is some debate as to whether mean can be used in ordinal measurements a One-way ANOVA was undertaken as a one-way ANOVA 'will tell you whether there are significant differences in the mean scores on the dependent variables across the three groups' (Pallant, 2016, p 256). Pallant (2016) also highlights that 'the main thing you are interested in is the column marked Sig. (this is the P value). If the Sig. value is less than or equal to .05, there is a significant difference somewhere among the mean scores on your dependent variable for the three groups.' (Pallant, 2016, p.259). While the significance is not below or equal to .05 it is not far from it. While we note that this is not the appropriate test as it was a parametric test, it was undertaken as there is debate around the use of the mean and the greater power that a one-way ANOVA has over its non-parametric alternative, the Kruskal-Wallis test.

**Q.2 Learning and Development interventions (formal and informal) in the organisation are integrated through the organisation.**

**Fig. 11**



5. Learning and Development interventions (formal and informal) in the organisation are integrated through the organisation

| Value | | Percent | Responses |
|---|---|---|---|
| Disagree | | 8.5% | 4 |
| Neither agree nor disagree | | 12.8% | 6 |
| Agree | | 57.4% | 27 |
| Strongly agree | | 21.3% | 10 |
| | | | Totals: 47 |
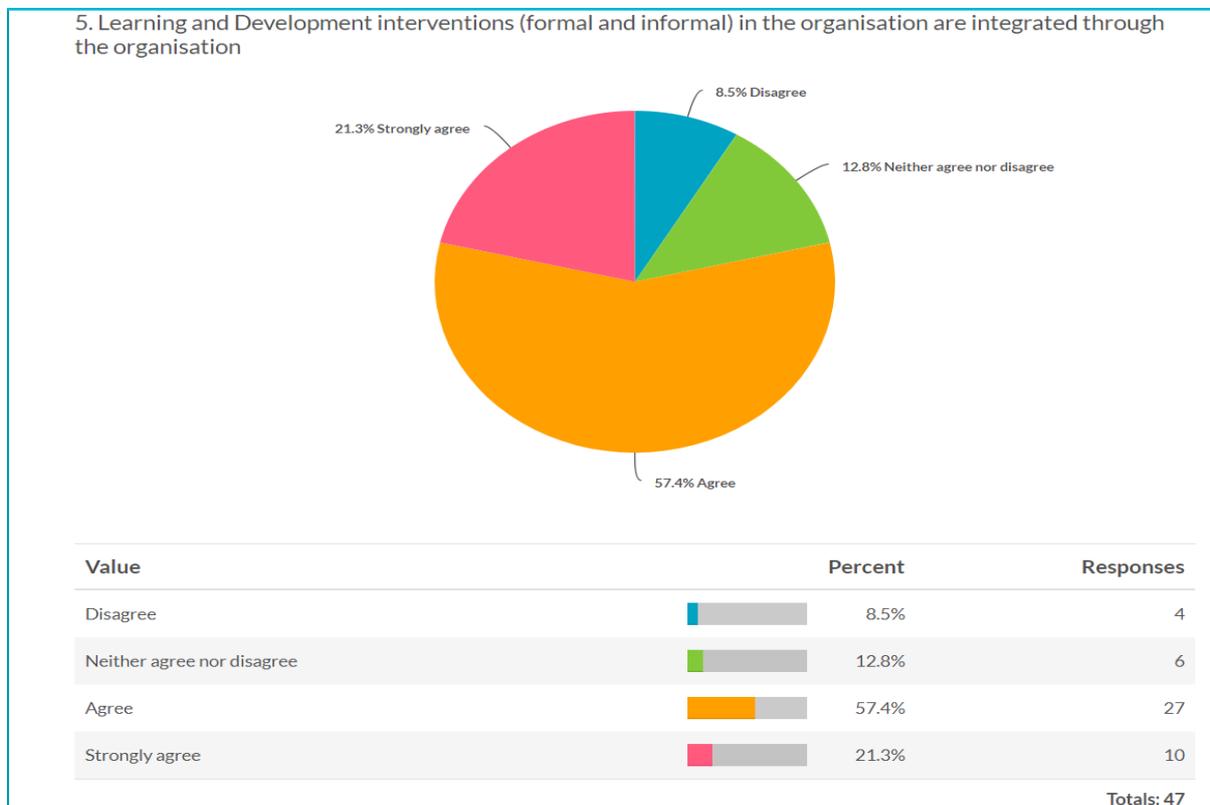
Looking at the most basic, undifferentiated by group levels of agreement and disagreement from respondents, again the level of agreements is quite high with 57.4 per cent and 21.3 per cent of all respondents either agreeing or strongly agreeing with the statement that L&D interventions are integrated through the organisation. This was reflected in the 9 qualitative element of the research with all bar one interviewee being broadly positive about the level of integration that exists for L&D interventions in their organisation.

**Reliability**

As the reliability test was run for the full suite of survey questions and was reported in Q. 1 we will not repeat the finding for the remaining 6 questions.

# Descriptive statistics

**Fig. 12 Cross Tabs**

**Q2 * Job Title general Crosstabulation**

Count

| | | Job Title general | | | |
|---|---|---|---|---|---|
| | | Engineering Manager | HR Manager | Engineer | Total |
| Q2 | Disagree | 3 | 0 | 1 | 4 |
| | Neither agree nor disagree | 0 | 0 | 6 | 6 |
| | Agree | 2 | 3 | 22 | 27 |
| | Strongly agree | 1 | 2 | 7 | 10 |
| Total | | 6 | 5 | 36 | 47 |

**Fig. 13 Bar Chart**
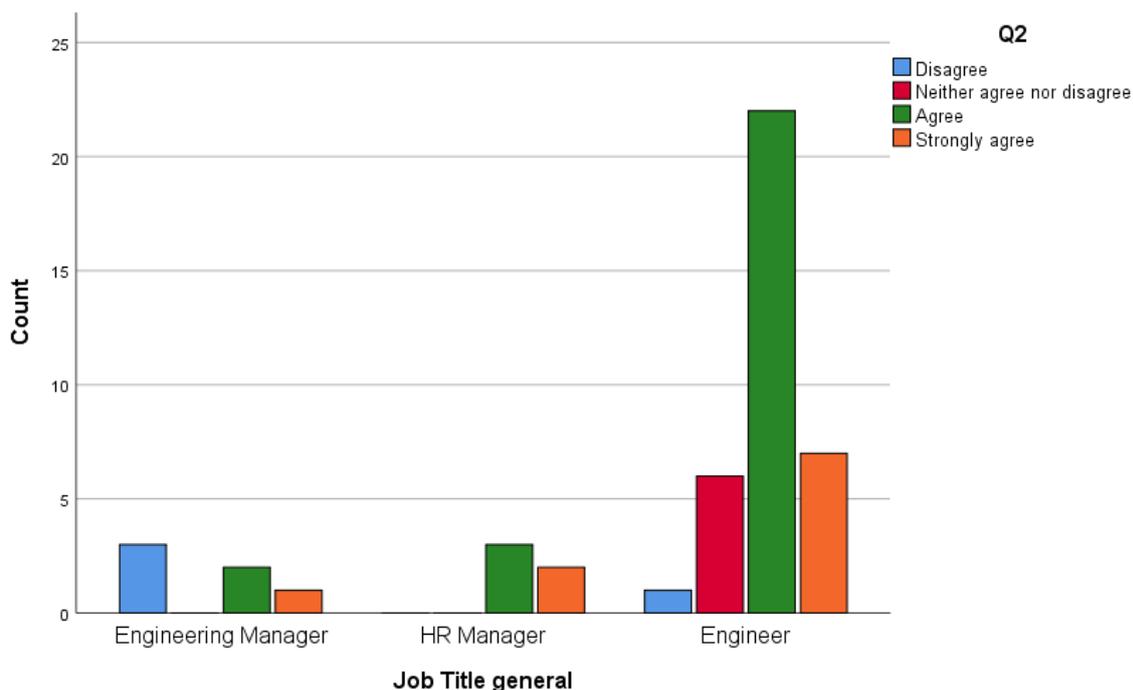


The crosstabs and bar charts are presented above in figures 12 and 13, again we can observe difference between the two engineering groups and the HR/LD Manager groups. As in question 1, all six of the HR/L&D Managers either agreed or strongly agreed with the statement 'Learning and Development interventions (formal and informal) in the organisation are integrated through the organisation', while three of the Engineering Mangers and one Engineer also disagreed with the statement. This is supported through the interviews with the Engineering Managers. In answer to the

second qualitative question, when asked if L&D interventions are integrated through the company, Interviewee I responded "we do have policies and procedures for training but as regards L&D for the future it wouldn't be as structured as what you might see in larger companies", while Interviewee E noted "Some are, when it comes to the technical side of the business and quality it's very rigid around the regulatory side of things so everyone's got very prescriptive things around learning plans for every role that comes into the business, so it's all online Learning interventions that you are given. When it comes to some of the day to day skills, the technical skills for running a piece of equipment or running a machine, it's left locally to the plants and they all do it differently".

**Fig 14.**

**Descriptives**

| | Job Title general | | | Statistic | Std. Error |
|---|---|---|---|---|---|
| Q2 | Engineering Manager | Mean | | 3.1667 | .54263 |
| | | 95% Confidence Interval for Mean | Lower Bound | 1.7718 | |
| | | | Upper Bound | 4.5615 | |
| | | 5% Trimmed Mean | | 3.1296 | |
| | | Median | | 3.0000 | |
| | | Variance | | 1.767 | |
| | | Std. Deviation | | 1.32916 | |
| | | Minimum | | 2.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 3.00 | |
| | | Interquartile Range | | 2.25 | |
| | | Skewness | | .326 | .845 |
| | | Kurtosis | | -2.253 | 1.741 |
| | HR Manager | Mean | | 4.4000 | .24495 |
| | | 95% Confidence Interval for Mean | Lower Bound | 3.7199 | |
| | | | Upper Bound | 5.0801 | |
| | | 5% Trimmed Mean | | 4.3889 | |
| | | Median | | 4.0000 | |
| | | Variance | | .300 | |
| | | Std. Deviation | | .54772 | |
| | | Minimum | | 4.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 1.00 | |
| | | Interquartile Range | | 1.00 | |
| | | Skewness | | .609 | .913 |
| | | Kurtosis | | -3.333 | 2.000 |
| | Engineer | Mean | | 3.9429 | .11554 |

| | | | |
|---|---|---|---|
| 95% Confidence Interval for Mean | Lower Bound | 3.7081 | |
| | Upper Bound | 4.1777 | |
| 5% Trimmed Mean | | 3.9683 | |
| Median | | 4.0000 | |
| Variance | | .467 | |
| Std. Deviation | | .68354 | |
| Minimum | | 2.00 | |
| Maximum | | 5.00 | |
| Range | | 3.00 | |
| Interquartile Range | | .00 | |
| Skewness | | -.515 | .398 |
| Kurtosis | | .973 | .778 |

**Fig. 15**

**Tests of Normality**

| | Job Title general | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Q2 | Engineering Manager | .310 | 6 | .074 | .805 | 6 | .065 |
| | HR Manager | .367 | 5 | .026 | .684 | 5 | .006 |
| | Engineer | .333 | 35 | .000 | .799 | 35 | .000 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As previously explained a Sig. value of greater than .05 indicates normality, as the sig value is under for 0.05 for two of the groups as presented in Fig. 15, an assumption of non-normality can be assumed. As presented in Fig. 14 we can report median values of 3 ('neither agree nor disagree') for Engineering Managers, 4.0 ('Agree') for Engineers and 4.0 ('Agree') for HR/L&D Managers.

**Kruskal-Wallis Test**

**Fig. 16**

**Ranks**

| | Job Title general | N | Mean Rank |
|---|---|---|---|
| Q2 | Engineering Manager | 6 | 16.33 |
| | HR Manager | 5 | 31.40 |
| | Engineer | 36 | 24.25 |
| | Total | 47 | |

**Fig. 17**

**Test Statistics**[a,b]

|  | Q2 |
|---|---|
| Kruskal-Wallis H | 4.188 |
| df | 2 |
| Asymp. Sig. | .123 |

a. Kruskal Wallis Test

b. Grouping Variable: Job Title general

As outlined in the results of Q.1 we are dealing with non-parametric statistics as the measure is ordinal and non-normally distributed. A Kruskal-Wallis Test was undertaken with the results presented in Figues 16 and 17. The variable in question was whether L&D interventions are integrated through respondents' organisation. As noted in Q.1, if the significance level is less than .05 then you can conclude that there is a significant statistical difference in the continuous variable across the three groups. As the Asymp. Sig is greater than .05 at .123, then we cannot assume there to be statistical variance between the three groups.

**Oneway ANOVA**

**Fig. 18**

**ANOVA**

|  |  | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Q2 | Between Groups | 4.654 | 2 | 2.327 | 3.791 | .030 |
|  | Within Groups | 27.006 | 44 | .614 |  |  |
|  | Total | 31.660 | 46 |  |  |  |

As noted in Q.1 we are dealing with non-parametric statistics and therefore strictly speaking the oneway ANOVA test is not applicable. Also previously noted was the fact that there is debate around the use of the mean in relation to ordinal data and the fact that parametric tests have greater explanatory power than their non-parametric counterparts. For these two reasons oneway ANOVA tests were run for the three groups for each of our seven quantitative questions. As outlined in Q.1, if the Sig. value is less than or equal to .05, there is a significant difference somewhere among the mean scores on your dependent variable for the three groups. As highlighted in Fig. 18 the Sig. value is 0.030 and thus if a parametric test were fully applicable we could note variance between the groups.

**Q.3 Learning and Development interventions (formal and informal) are improving the professional competence (knowledge, skills and behaviours) of individual engineers in the company.**

**Fig. 19**



6. Learning and Development interventions (formal and informal) are improving the professional competence (knowledge, skills and behaviours) of individual engineers in the company
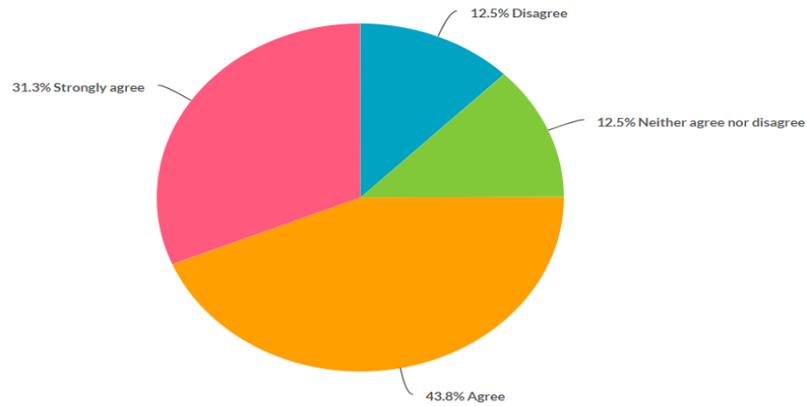
| Value | | Percent | Responses |
|---|---|---|---|
| Disagree | | 12.5% | 6 |
| Neither agree nor disagree | | 12.5% | 6 |
| Agree | | 43.8% | 21 |
| Strongly agree | | 31.3% | 15 |
| | | | Totals: 48 |

As presented in Fig. 19, 43.8 per cent and 31.3 per cent of all respondents respectively agreed with the statement that L&D interventions are improving the competence of individual engineers. While 12.5 per cent of respondents both disagreed with the statement and chose the neutral option of 'neither agree nor disagree'.

**Descriptive statistics**

**Cross Tabs**

**Q3 Learning and Development interventions (formal and informal) are improving the professional competence (knowledge, skills and behaviours) of individual engineers in the company**

**Fig. 20**

Count

| | | Job Title general | | | |
|---|---|---|---|---|---|
| | | Engineering Manager | HR Manager | Engineer | Total |
| Q3 | Disagree | 2 | 0 | 4 | 6 |
| | Neither agree nor disagree | 1 | 0 | 5 | 6 |
| | Agree | 1 | 4 | 16 | 21 |
| | Strongly agree | 2 | 2 | 11 | 15 |
| Total | | 6 | 6 | 36 | 48 |

**Graph/Bar Chart**

**Fig. 21**
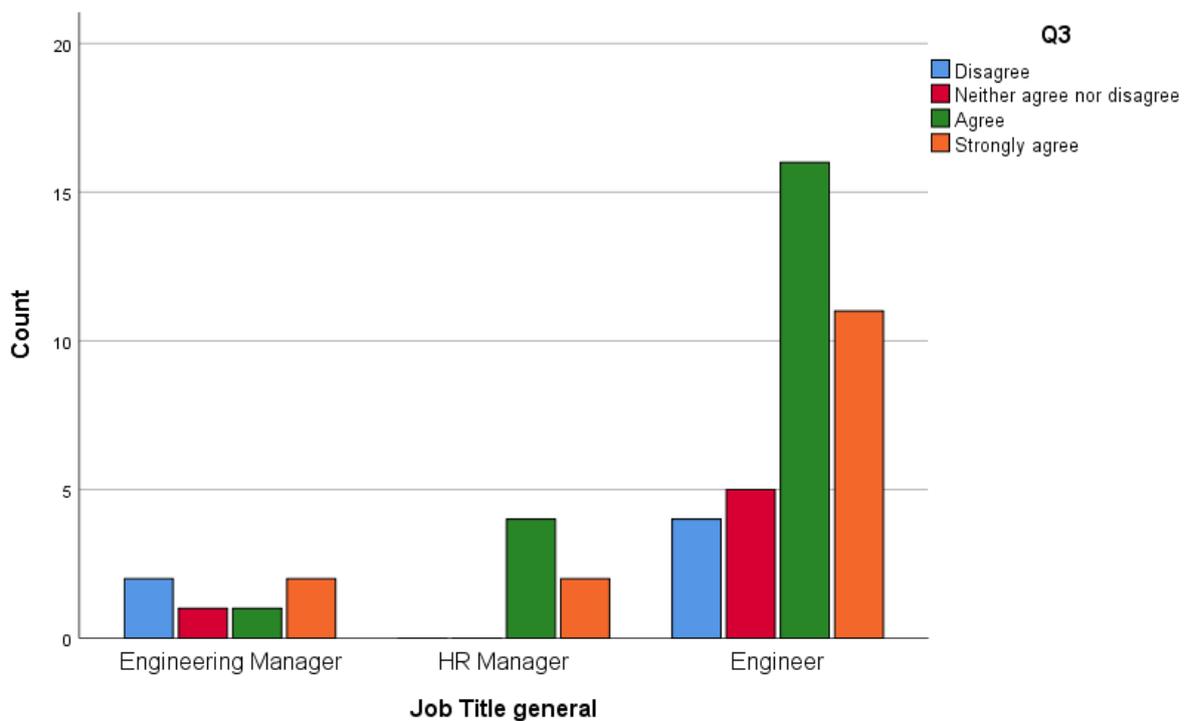


As presented in figures 20 and 21 and as was found in Q's 1 & 2, all six of the HR/L&D Managers either agreed or strongly agreed with the statement in Question 3, while 2 of the Engineering Managers

disagreed with the statement and four Engineers disagreed with the statement. Five Engineers chose the neutral option of 'Neither agree nor disagree' while one of the Engineering Managers also took this option.

**Fig. 22**

**Descriptives**

| | Job Title general | | | Statistic | Std. Error |
|---|---|---|---|---|---|
| Q3 | Engineering Manager | Mean | | 3.5000 | .56273 |
| | | 95% Confidence Interval for Mean | Lower Bound | 2.0535 | |
| | | | Upper Bound | 4.9465 | |
| | | 5% Trimmed Mean | | 3.5000 | |
| | | Median | | 3.5000 | |
| | | Variance | | 1.900 | |
| | | Std. Deviation | | 1.37840 | |
| | | Minimum | | 2.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 3.00 | |
| | | Interquartile Range | | 3.00 | |
| | | Skewness | | .000 | .845 |
| | | Kurtosis | | -2.299 | 1.741 |
| | HR Manager | Mean | | 4.4000 | .24495 |
| | | 95% Confidence Interval for Mean | Lower Bound | 3.7199 | |
| | | | Upper Bound | 5.0801 | |
| | | 5% Trimmed Mean | | 4.3889 | |
| | | Median | | 4.0000 | |
| | | Variance | | .300 | |
| | | Std. Deviation | | .54772 | |
| | | Minimum | | 4.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 1.00 | |
| | | Interquartile Range | | 1.00 | |
| | | Skewness | | .609 | .913 |
| | | Kurtosis | | -3.333 | 2.000 |
| | Engineer | Mean | | 3.9429 | .16369 |
| | | 95% Confidence Interval for Mean | Lower Bound | 3.6102 | |
| | | | Upper Bound | 4.2755 | |
| | | 5% Trimmed Mean | | 3.9921 | |
| | | Median | | 4.0000 | |
| | | Variance | | .938 | |
| | | Std. Deviation | | .96841 | |

| | | |
|---|---|---|
| Minimum | 2.00 | |
| Maximum | 5.00 | |
| Range | 3.00 | |
| Interquartile Range | 2.00 | |
| Skewness | -.705 | .398 |
| Kurtosis | -.304 | .778 |

**Fig. 23**

### Tests of Normality

| Job Title general | | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Q3 | Engineering Manager | .195 | 6 | .200[*] | .861 | 6 | .191 |
| | HR Manager | .367 | 5 | .026 | .684 | 5 | .006 |
| | Engineer | .266 | 35 | .000 | .835 | 35 | .000 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As presented in Figure 23, an assumption of non-normality can be made as two of the groups (again the HR Managers and Engineers) have Sig. values of less than .05. As presented in Fig. 22 we can report median values of 3.5 (between 'neither agree nor disagree' and 'Agree') for Engineering Managers, 4.0 ('Agree') for Engineers and 4.0 ('Agree') for HR/L&D Managers.

**Kruskal-Wallis Test**

**Fig. 25**

### Ranks

| | Job Title general | N | Mean Rank |
|---|---|---|---|
| Q3 | Engineering Manager | 6 | 20.25 |
| | HR Manager | 6 | 29.00 |
| | Engineer | 36 | 24.46 |
| | Total | 48 | |

**Fig. 26**

### Test Statistics[a,b]

| | Q3 |
|---|---|
| Kruskal-Wallis H | 1.330 |

59

| | |
|---|---|
| df | 2 |
| Asymp. Sig. | .514 |

a. Kruskal Wallis Test

b. Grouping Variable: Job Title general

The output results from the Kruskal-Wallis Test for question 3 are presented in figures 25 and 26. The variable in question was whether L&D interventions are improving the competences of engineers in the organisation. As the Asymp. Sig is greater than .05 at .514, we cannot assume there to be statistical variance between the three groups.

**Oneway ANOVA**

**Fig. 27**

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Q3 | Between Groups | 2.090 | 2 | 1.045 | 1.101 | .341 |
| | Within Groups | 42.722 | 45 | .949 | | |
| | Total | 44.812 | 47 | | | |

The results of the oneway ANOVA for question 3 are presented in figure 27. The Sig. value is .341 and thus if a parametric test were fully applicable would not be able to accept variance between the groups.

**Q.4 The improvement of individual engineers' competence positively impacts on organisational performance.**

**Fig. 28**



7. The improvement of individual engineers' competence positively impacts on organisational performance
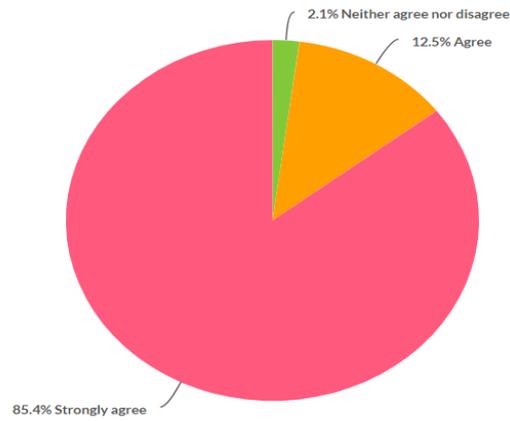
| Value | | Percent | Responses |
|---|---|---|---|
| Neither agree nor disagree | | 2.1% | 1 |
| Agree | | 12.5% | 6 |
| Strongly agree | | 85.4% | 41 |
| | | | Totals: 48 |

Fig. 28 presents the overall, ungrouped statistics as to whether respondents agreed or not that the improvement of individual engineers' competence positively impacts on organisational performance. 85.4 per cent of all respondents strongly agreed with the statement, 12.5 per cent agreed with it and 2.1 per cent neither agreed nor disagreed.

**Descriptive statistics**

**Cross Tabs**

**Fig. 29**

**Q4 The improvement of individual engineers' competence positively impacts on organisational performance**

Count

| | | Job Title general | | | Total |
|---|---|---|---|---|---|
| | | Engineering Manager | HR Manager | Engineer | |
| Q4 | Neither agree nor disagree | 0 | 0 | 1 | 1 |
| | Agree | 0 | 1 | 5 | 6 |
| | Strongly agree | 6 | 5 | 30 | 41 |
| Total | | 6 | 6 | 36 | 48 |

**Fig. 30**

**Graph/Bar Chart**
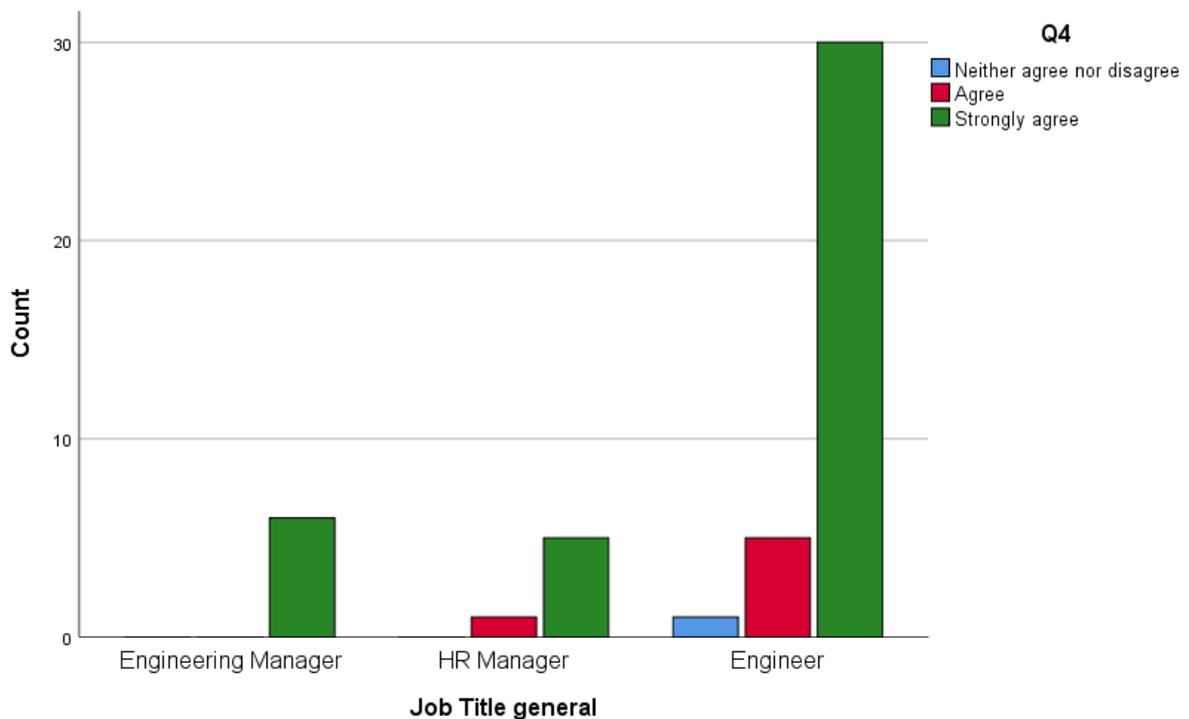


Figures 29 and 30 demonstrate the strong level of agreement across all three groups with all Engineering Managers strongly agreeing with the statement, five of the HR Managers strongly agreeing with it and thirty of the thirty-six Engineers strongly agreeing with the statement.

**Fig. 31**

**Descriptives**

| | Job Title general | | | Statistic | Std. Error |
|---|---|---|---|---|---|
| Q4 | Engineering Manager | Mean | | 5.0000 | .00000 |
| | | 95% Confidence Interval for Mean | Lower Bound | 5.0000 | |
| | | | Upper Bound | 5.0000 | |
| | | 5% Trimmed Mean | | 5.0000 | |
| | | Median | | 5.0000 | |
| | | Variance | | .000 | |
| | | Std. Deviation | | .00000 | |
| | | Minimum | | 5.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | .00 | |
| | | Interquartile Range | | .00 | |
| | | Skewness | | . | . |
| | | Kurtosis | | . | . |
| | HR Manager | Mean | | 5.0000 | .00000 |
| | | 95% Confidence Interval for Mean | Lower Bound | 5.0000 | |
| | | | Upper Bound | 5.0000 | |
| | | 5% Trimmed Mean | | 5.0000 | |
| | | Median | | 5.0000 | |
| | | Variance | | .000 | |
| | | Std. Deviation | | .00000 | |
| | | Minimum | | 5.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | .00 | |
| | | Interquartile Range | | .00 | |
| | | Skewness | | . | . |
| | | Kurtosis | | . | . |
| | Engineer | Mean | | 4.8000 | .07992 |
| | | 95% Confidence Interval for Mean | Lower Bound | 4.6376 | |
| | | | Upper Bound | 4.9624 | |
| | | 5% Trimmed Mean | | 4.8651 | |
| | | Median | | 5.0000 | |
| | | Variance | | .224 | |
| | | Std. Deviation | | .47279 | |
| | | Minimum | | 3.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 2.00 | |

| | | |
|---|---|---|
| Interquartile Range | .00 | |
| Skewness | -2.409 | .398 |
| Kurtosis | 5.560 | .778 |

**Fig. 32**

**Tests of Normality**

| | Job Title general | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Q4 | Engineering Manager | . | 6 | . | . | 6 | . |
| | HR Manager | . | 5 | . | . | 5 | . |
| | Engineer | .492 | 35 | .000 | .477 | 35 | .000 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As presented in figure 32, an assumption of non-normality can be made as all groups have Sig. values of less than .05. As presented in Fig. 31 we can report a median value of 5.0 (Strongly agree) for all groups.

**Kruskal-Wallis Test**

**Fig. 33**

**Ranks**

| | Job Title general | N | Mean Rank |
|---|---|---|---|
| Q4 | Engineering Manager | 6 | 28.00 |
| | HR Manager | 6 | 24.08 |
| | Engineer | 36 | 23.99 |
| | Total | 48 | |
| | Total | 47 | |

**Fig. 34**

**Test Statistics[a,b]**

| | Q4 |
|---|---|
| Kruskal-Wallis H | 1.144 |
| df | 2 |
| Asymp. Sig. | .565 |

a. Kruskal Wallis Test

b. Grouping Variable: Job Title general

The output results from the Kruskal-Wallis Test for question 4 are presented in figures 33 and 34. The variable in question was the improvement of individual engineers' competence positively impacts on organisational performance. As the Asymp. Sig is greater than .05 at .565, we cannot assume there to be statistical variance between the three groups.

**Oneway ANOVA**

**Fig. 35**

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Q4 | Between Groups | .194 | 2 | .097 | .516 | .600 |
| | Within Groups | 8.472 | 45 | .188 | | |
| | Total | 8.667 | 47 | | | |

The results of the oneway ANOVA for question 3 are presented in figure 35. The Sig. value is .341 and thus if a parametric test were fully applicable would not be able to accept variance between the groups.

**Q.5 The Company measures the impact of Learning and Development interventions on engineers' competence.**

**Fig. 36**



8. The company measures the impact of Learning and Development interventions on engineers' competence

| Value | | Percent | Responses |
|---|---|---|---|
| Strongly disagree | | 8.3% | 4 |
| Disagree | | 29.2% | 14 |
| Neither agree nor disagree | | 35.4% | 17 |
| Agree | | 20.8% | 10 |
| Strongly agree | | 6.3% | 3 |

Totals: 48
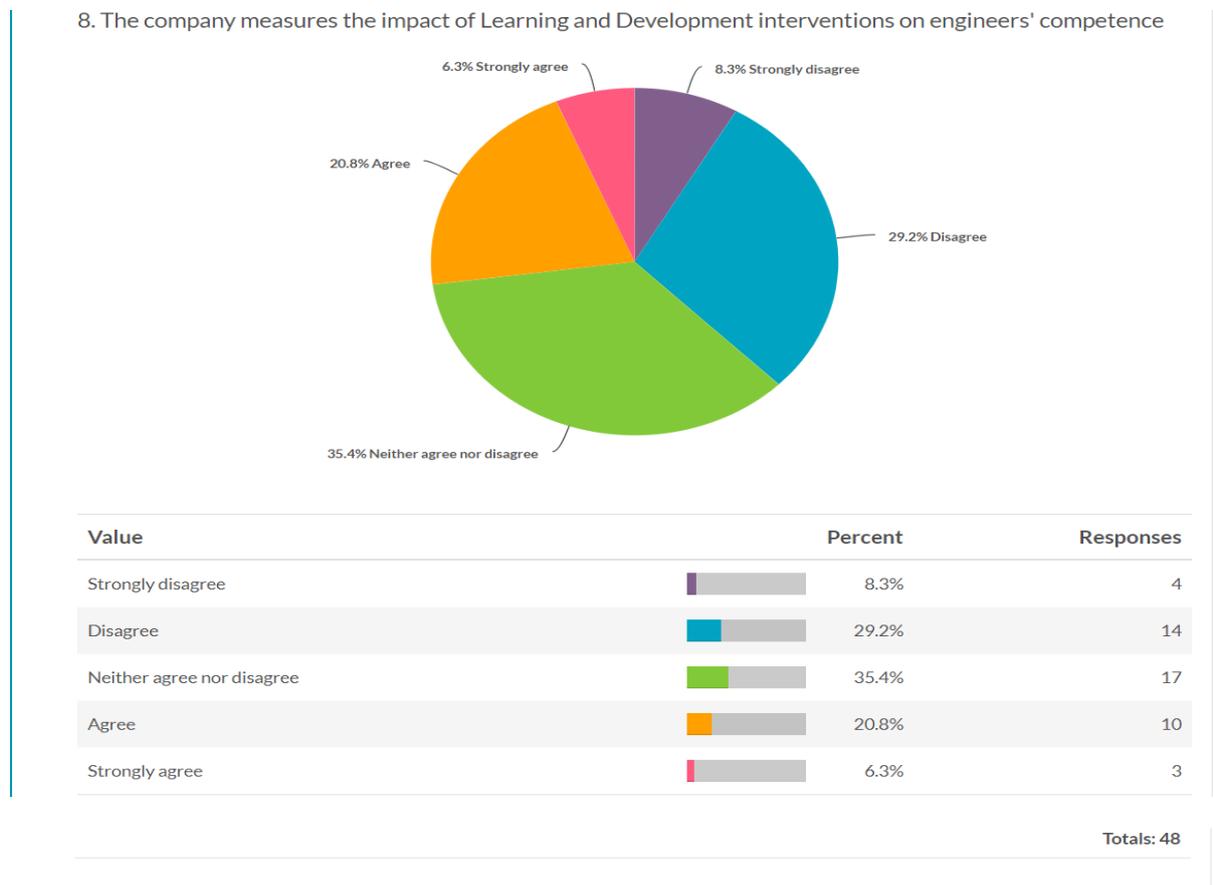
Fig. 36 presents the overall, ungrouped statistics as to whether respondents agreed or not that the company their Company measures the impact of Learning and Development interventions on engineers' competence. There was quite a wide spread of answers, with the most frequent option chose being the neutral 'Neither agree nor disagree' at 35.4 per cent, the second most frequent was 'Disagree' at 29.2 per cent, third was 'Agree' at 20.8 per cent, 'Strongly disagree' and 'Strongly agree' received 8.3 and 6.3 per cent respectively.

**Descriptive statistics**

**Cross Tabs**

**Fig. 37**

**Q5 The company measures the impact of Learning and Development interventions on engineers' competence**

Count

| | | Job Title general | | | |
|---|---|---|---|---|---|
| | | Engineering Manager | HR Manager | Engineer | Total |
| Q5 | Strongly disagree | 1 | 0 | 3 | 4 |
| | Disagree | 2 | 3 | 9 | 14 |
| | Neither agree nor disagree | 2 | 0 | 15 | 17 |
| | Agree | 1 | 2 | 7 | 10 |
| | Strongly agree | 0 | 1 | 2 | 3 |
| Total | | 6 | 6 | 36 | 48 |

**Fig. 38**

**Graph/Bar Chart**
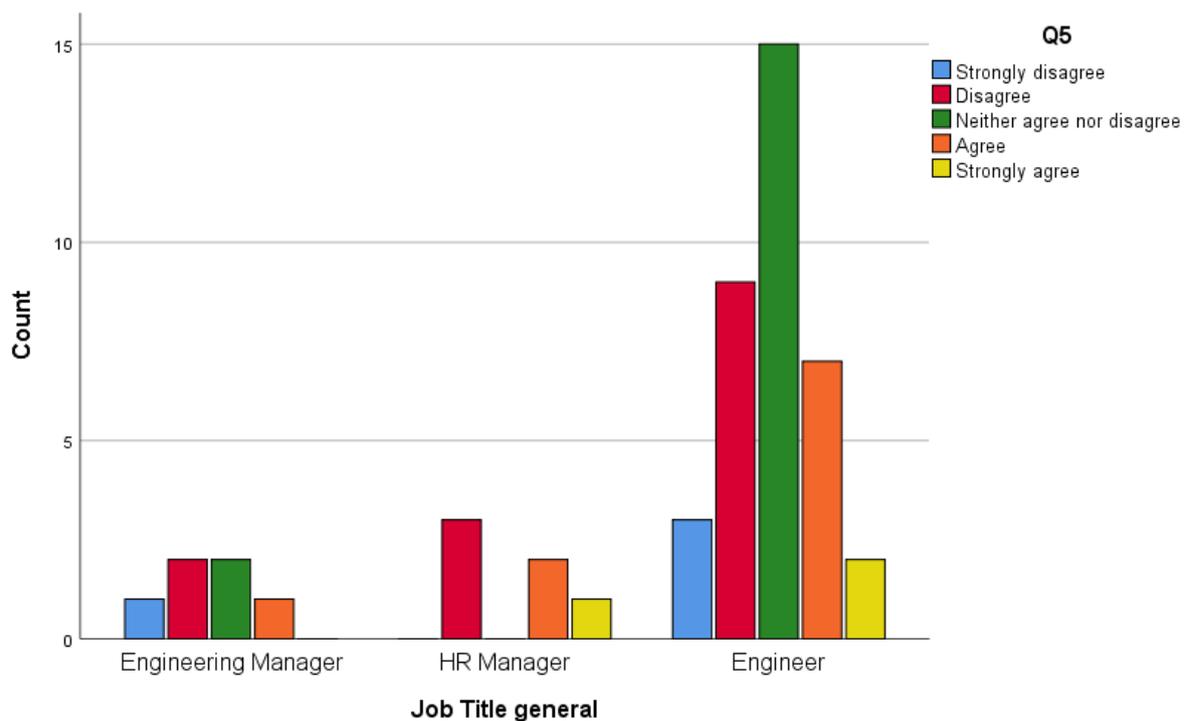


Figures 37 and 38 demonstrate the variety of responses across the three groups, with only one of the Engineering Managers agreeing with the statement in questions, two of them neither agreeing nor disagreeing, two disagreeing with the statement and one strongly disagreeing with it. The HR/L&D Managers group was quite dispersed too, with three respondents disagreeing with the statement, two agreeing and one agreeing strongly. The most frequent response from the Engineering group was 'Neither agree nor disagree' with 15 respondents choosing this option. Some of the disagreement on

the idea of measuring the impact of L&D interventions on engineers competence came through in the qualitative questions with Interviewee A stating 'in terms of the interventions we probably aren't so good at assessing afterwards if or how much it has been a success', while Interviewee E when asked if the organisation and Engineering Managers evaluate the impact of L&D interventions on the competence of engineers they replied 'No, we don't, but it's something that as we evolve we will.

**Fig. 39**

**Descriptives**

| | Job Title general | | | Statistic | Std. Error |
|---|---|---|---|---|---|
| Q5 | Engineering Manager | Mean | | 2.5000 | .42817 |
| | | 95% Confidence Interval for Mean | Lower Bound | 1.3993 | |
| | | | Upper Bound | 3.6007 | |
| | | 5% Trimmed Mean | | 2.5000 | |
| | | Median | | 2.5000 | |
| | | Variance | | 1.100 | |
| | | Std. Deviation | | 1.04881 | |
| | | Minimum | | 1.00 | |
| | | Maximum | | 4.00 | |
| | | Range | | 3.00 | |
| | | Interquartile Range | | 1.50 | |
| | | Skewness | | .000 | .845 |
| | | Kurtosis | | -.248 | 1.741 |
| | HR Manager | Mean | | 3.4000 | .60000 |
| | | 95% Confidence Interval for Mean | Lower Bound | 1.7341 | |
| | | | Upper Bound | 5.0659 | |
| | | 5% Trimmed Mean | | 3.3889 | |
| | | Median | | 4.0000 | |
| | | Variance | | 1.800 | |
| | | Std. Deviation | | 1.34164 | |
| | | Minimum | | 2.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 3.00 | |
| | | Interquartile Range | | 2.50 | |
| | | Skewness | | -.166 | .913 |
| | | Kurtosis | | -2.407 | 2.000 |
| | Engineer | Mean | | 2.8857 | .17282 |
| | | 95% Confidence Interval for Mean | Lower Bound | 2.5345 | |
| | | | Upper Bound | 3.2369 | |
| | | 5% Trimmed Mean | | 2.8730 | |

| | | |
|---|---|---|
| Median | 3.0000 | |
| Variance | 1.045 | |
| Std. Deviation | 1.02244 | |
| Minimum | 1.00 | |
| Maximum | 5.00 | |
| Range | 4.00 | |
| Interquartile Range | 2.00 | |
| Skewness | .065 | .398 |
| Kurtosis | -.258 | .778 |

**Fig. 40**

**Tests of Normality**

| | Job Title general | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Q5 | Engineering Manager | .183 | 6 | .200* | .960 | 6 | .820 |
| | HR Manager | .273 | 5 | .200* | .852 | 5 | .201 |
| | Engineer | .202 | 35 | .001 | .916 | 35 | .011 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As presented in Fig. 39 we can report median values of 2.5 (between 'Disagree' and 'Neither agree nor disagree') for Engineering Managers, 3.0 (Neither agree nor disagree') for Engineers and 4.0 ('Agree') for HR/L&D Managers. As presented in figure 40, an assumption of normal distribution can be made for two out of the three groups as they exceed Sig. values of greater than .05.

**Kruskal-Wallis Test**

**Fig. 41**

**Ranks**

| | Job Title general | N | Mean Rank |
|---|---|---|---|
| Q5 | Engineering Manager | 6 | 20.00 |
| | HR Manager | 6 | 27.08 |
| | Engineer | 36 | 24.82 |
| | Total | 48 | |

**Fig. 42**

**Test Statistics[a,b]**

|  | Q5 |
| --- | --- |
| Kruskal-Wallis H | .915 |
| df | 2 |
| Asymp. Sig. | .633 |

a. Kruskal Wallis Test

b. Grouping Variable: Job Title general

As we are still dealing with ordinal measurements and thus non-parametric statistics, a Kruskal-Wallis Test for question 5 was undertaken and the output results are presented in figures 41 and 42. The variable in question was whether L&D interventions are being measured in terms of their effect on engineers' competence. As the Asymp. Sig is greater than .05 at .633, we cannot assume there to be statistical variance between the three groups.

**Oneway ANOVA**

**Fig. 43**

**ANOVA**

|  |  | Sum of Squares | df | Mean Square | F | Sig. |
| --- | --- | --- | --- | --- | --- | --- |
| Q5 | Between Groups | 1.361 | 2 | .681 | .614 | .546 |
|  | Within Groups | 49.889 | 45 | 1.109 |  |  |
|  | Total | 51.250 | 47 |  |  |  |

The results of the oneway ANOVA for question 5 are presented in figure 43. The Sig. value is .546 and thus if a parametric test were fully applicable would not be able to accept variance between the groups.

**Q.6 The strategic objectives and goals of the company are communicated to the engineering cohort.**

**Fig. 44**



9. The strategic objectives and goals of the company are communicated to the engineering cohort

| Value | | Percent | Responses |
|-------|---|---------|-----------|
| Disagree | | 2.1% | 1 |
| Neither agree nor disagree | | 8.3% | 4 |
| Agree | | 47.9% | 23 |
| Strongly agree | | 41.7% | 20 |
| | | | Totals: 48 |
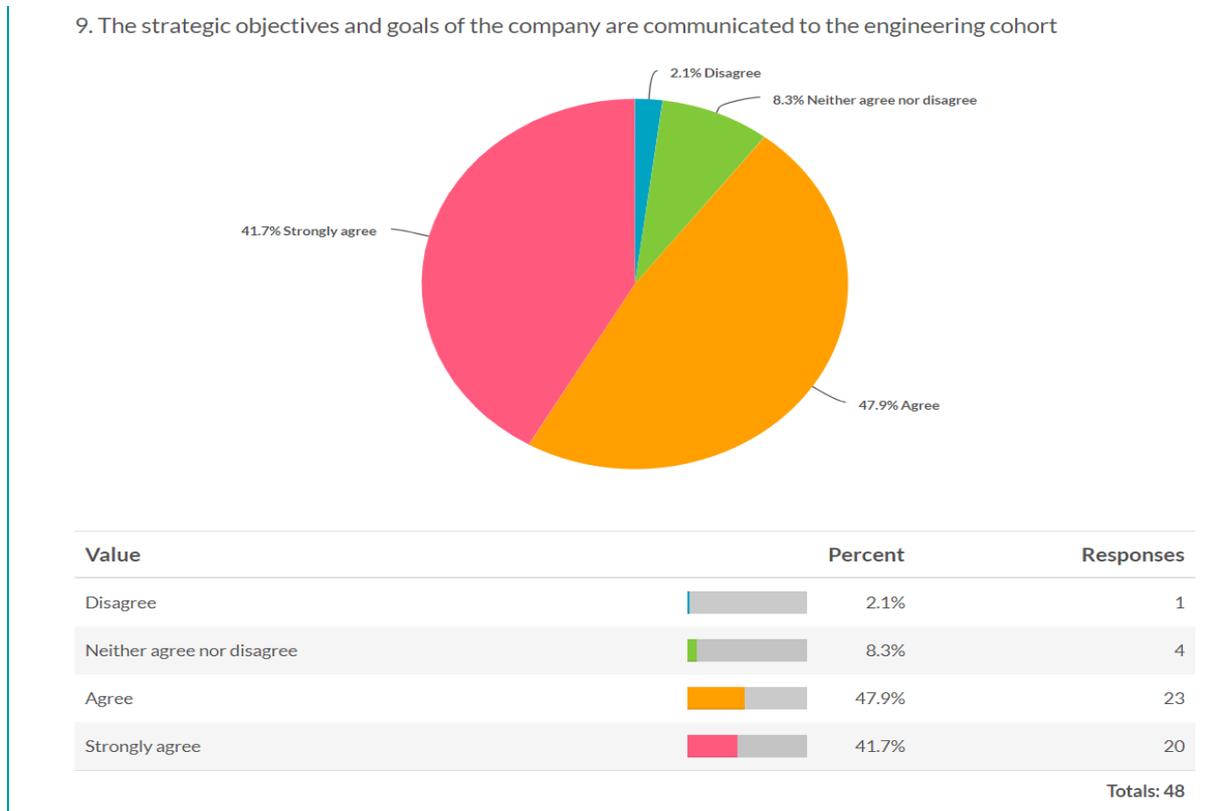
Fig. 44 presents the overall, ungrouped statistics as to whether respondents agreed or not that the objectives and goals of the organisation are communicated to the engineering cohort. 41.7 per cent of all respondents strongly agreed with the statement, 47.9 per cent agreed, 2.1 per cent disagreed and 8.3 per cent neither agreed nor disagreed.

**Descriptive statistics**

**Cross Tabs**

**Fig. 45**

**Q6 The strategic objectives and goals of the company are communicated to the engineering cohort**

Count

| | | Job Title general | | | |
|---|---|---|---|---|---|
| | | Engineering Manager | HR Manager | Engineer | Total |
| Q6 | Disagree | 1 | 0 | 0 | 1 |
| | Neither agree nor disagree | 1 | 0 | 3 | 4 |
| | Agree | 1 | 2 | 20 | 23 |

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| | | | | |
|---|---|---|---|---|
| Strongly agree | 3 | 4 | 13 | 20 |
| Total | 6 | 6 | 36 | 48 |

**Fig. 46**

**Graph/Bar Chart**
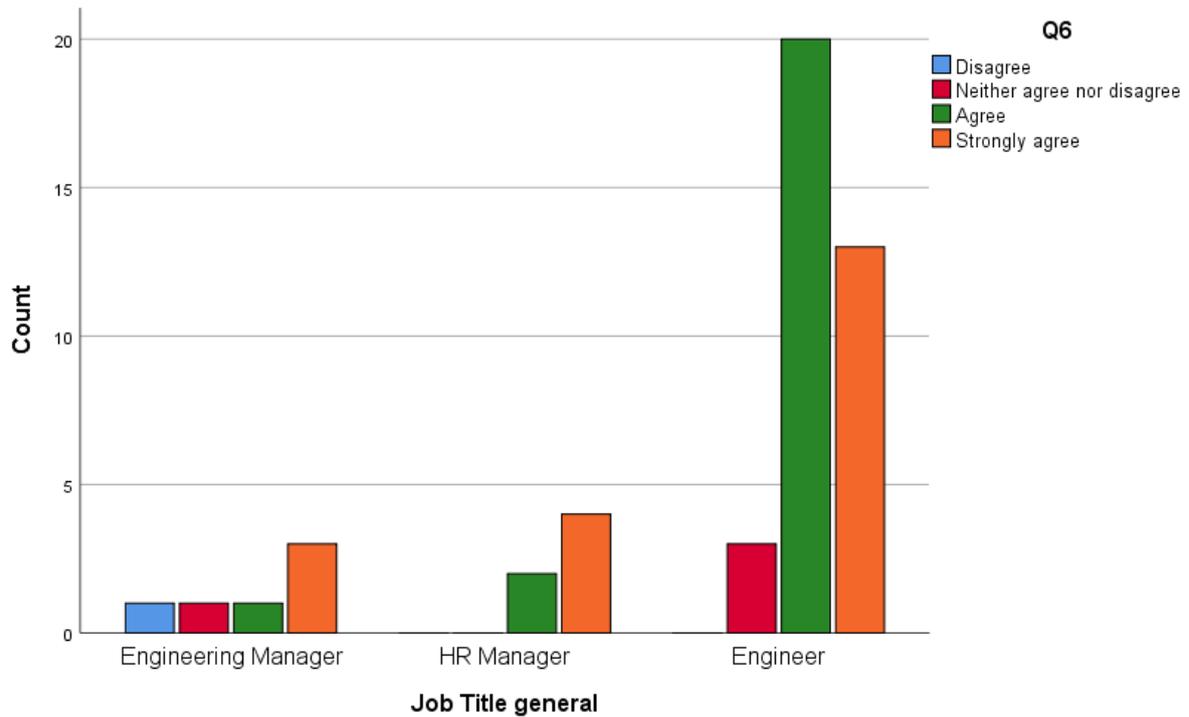


As presented in figures 45 and 46, all six of the HR/L&D Managers either agreed or strongly agreed with the statement in Question 6. While three of the Engineering Managers strongly agreed with the statement and one agreed, one neither agreed nor disagreed and one disagreed. All bar three of the engineering group either agreed or strongly agreed with the statement, while the other three neither agreed nor disagreed.

**Fig. 47**

**Descriptives**

| | Job Title general | | | Statistic | Std. Error |
|---|---|---|---|---|---|
| Q6 | Engineering Manager | Mean | | 4.0000 | .51640 |
| | | 95% Confidence Interval for Mean | Lower Bound | 2.6726 | |
| | | | Upper Bound | 5.3274 | |
| | | 5% Trimmed Mean | | 4.0556 | |

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| | | | | |
|---|---|---|---|---|
| | Median | | 4.5000 | |
| | Variance | | 1.600 | |
| | Std. Deviation | | 1.26491 | |
| | Minimum | | 2.00 | |
| | Maximum | | 5.00 | |
| | Range | | 3.00 | |
| | Interquartile Range | | 2.25 | |
| | Skewness | | -.889 | .845 |
| | Kurtosis | | -.781 | 1.741 |
| HR Manager | Mean | | 4.6000 | .24495 |
| | 95% Confidence Interval for Mean | Lower Bound | 3.9199 | |
| | | Upper Bound | 5.2801 | |
| | 5% Trimmed Mean | | 4.6111 | |
| | Median | | 5.0000 | |
| | Variance | | .300 | |
| | Std. Deviation | | .54772 | |
| | Minimum | | 4.00 | |
| | Maximum | | 5.00 | |
| | Range | | 1.00 | |
| | Interquartile Range | | 1.00 | |
| | Skewness | | -.609 | .913 |
| | Kurtosis | | -3.333 | 2.000 |
| Engineer | Mean | | 4.3143 | .09849 |
| | 95% Confidence Interval for Mean | Lower Bound | 4.1141 | |
| | | Upper Bound | 4.5144 | |
| | 5% Trimmed Mean | | 4.3492 | |
| | Median | | 4.0000 | |
| | Variance | | .339 | |
| | Std. Deviation | | .58266 | |
| | Minimum | | 3.00 | |
| | Maximum | | 5.00 | |
| | Range | | 2.00 | |
| | Interquartile Range | | 1.00 | |
| | Skewness | | -.153 | .398 |
| | Kurtosis | | -.533 | .778 |

**Fig. 48**

### Tests of Normality

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| Job Title general | Statistic | df | Sig. | Statistic | df | Sig. |

| Q6 | Engineering Manager | .285 | 6 | .138 | .831 | 6 | .110 |
|----|---------------------|------|---|------|------|---|------|
|    | HR Manager | .367 | 5 | .026 | .684 | 5 | .006 |
|    | Engineer | .334 | 35 | .000 | .741 | 35 | .000 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As presented in Fig. 48, an assumption of non-normality can be made as two of the groups (the HR Managers and Engineers) have Sig. values of less than .05. As presented in Fig.47 we can report median value of 4.5 (between 'Agree' and 'Strongly agree') for Engineering Managers, 4.0 ('Agree') for Engineers and 5.0 ('Strongly agree') for HR/L&D Managers.

**Kruskal-Wallis Test**

**Fig.49**

### Ranks

|    | Job Title general | N | Mean Rank |
|----|-------------------|---|-----------|
| Q6 | Engineering Manager | 6 | 22.83 |
|    | HR Manager | 6 | 31.33 |
|    | Engineer | 36 | 23.64 |
|    | Total | 48 | |

**Fig.50**

### Test Statistics[a,b]

|  | Q6 |
|--|----|
| Kruskal-Wallis H | 2.019 |
| df | 2 |
| Asymp. Sig. | .364 |

a. Kruskal Wallis Test

b. Grouping Variable: Job Title general

The output results from the Kruskal-Wallis Test for question 6 are presented in figures 49 and 50. The variable in question was whether the strategic objectives and goals of the company are communicated to the engineering cohort. As the Asymp. Sig is greater than .05 at .365, we cannot assume there to be statistical variance between the three groups.

**Oneway ANOVA**

**Fig.51**

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Q6 | Between Groups | 1.361 | 2 | .681 | 1.358 | .268 |
| | Within Groups | 22.556 | 45 | .501 | | |
| | Total | 23.917 | 47 | | | |

The results of the oneway ANOVA for question 6 are presented in figure 51. The Sig. value is .268 and thus if a parametric test were fully applicable we would not be able to accept variance between the groups.

**Q.7 The strategic objectives and goals of the company are understood by the engineering cohort.**

**Fig.52**



10. The strategic objectives and goals of the company are understood by the engineering cohort

| Value | | Percent | Responses |
|---|---|---|---|
| Disagree | | 6.4% | 3 |
| Neither agree nor disagree | | 14.9% | 7 |
| Agree | | 66.0% | 31 |
| Strongly agree | | 12.8% | 6 |
| | | | Totals: 47 |
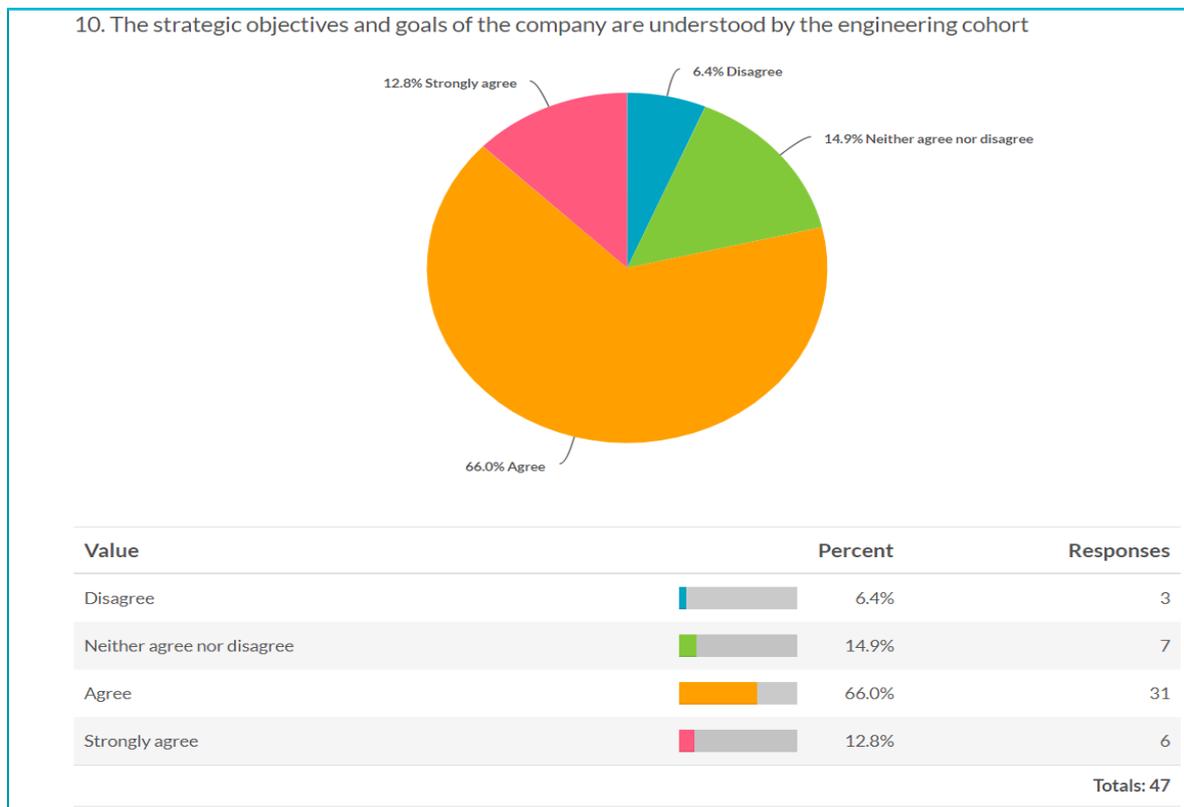
Fig. 52 presents the overall, ungrouped statistics as to whether respondents agreed or not that the objectives and goals of the company are understood by engineering cohort. 66.0 per cent of all respondents agreed with the statement, 12.8 per cent strongly agreed, 6.4 per cent disagreed and 14.9 per cent neither agreed nor disagreed.

**Descriptive statistics**

**Cross Tabs**

**Fig. 53**

**Q7 The strategic objectives and goals of the company are understood by the engineering cohort**

Count

| | | Job Title general | | | |
|---|---|---|---|---|---|
| | | Engineering Manager | HR Manager | Engineer | Total |
| Q7 | Disagree | 1 | 0 | 2 | 3 |
| | Neither agree nor disagree | 2 | 1 | 4 | 7 |
| | Agree | 2 | 4 | 25 | 31 |
| | Strongly agree | 1 | 1 | 4 | 6 |
| Total | | 6 | 6 | 35 | 47 |

**Fig. 54**

**Graph/Bar Chart**
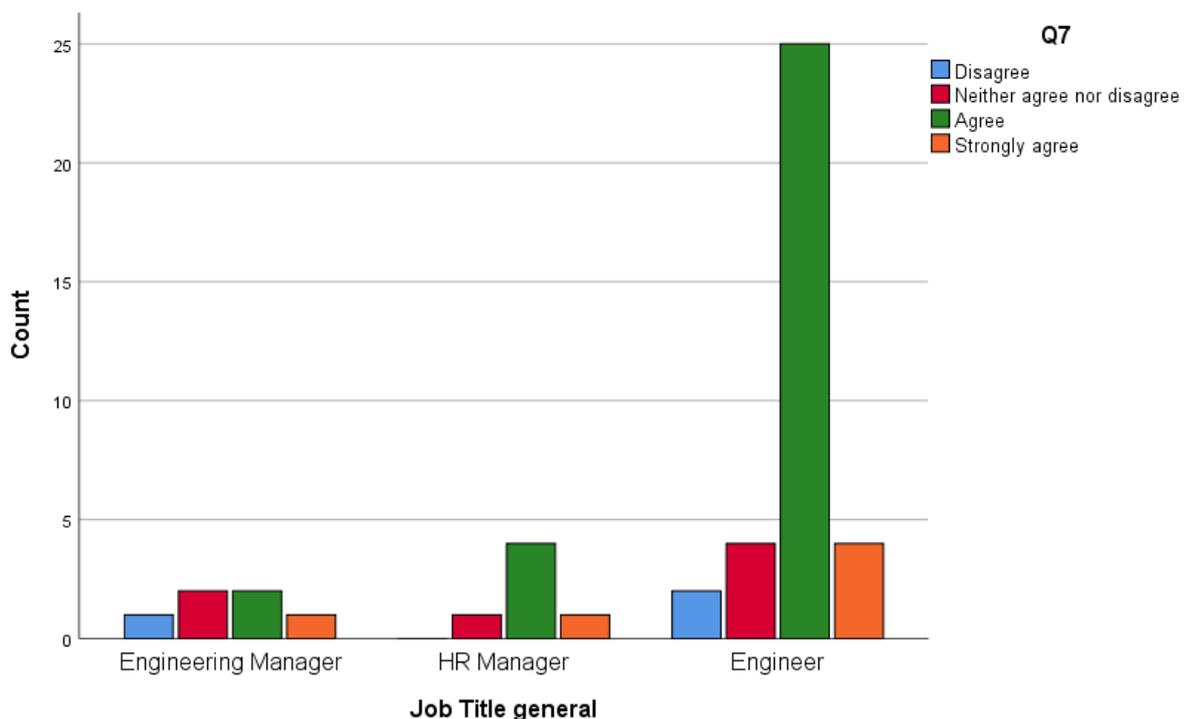


As presented in figures 53 and 54, five of the six HR/L&D Managers either agreed or strongly agreed with the statement in Question 7, while one neither agreed nor disagreed. Three of the Engineering Managers either strongly agreed or agreed with the statement, while two neither agreed nor disagreed and one disagreed with the statement. Twenty-five of the engineers either agreed or strongly agreed with the statement, four neither agreed nor disagreed and two disagreed.

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**Fig. 55**

**Descriptives**

| | Job Title general | | | Statistic | Std. Error |
|---|---|---|---|---|---|
| Q7 | Engineering Manager | Mean | | 3.5000 | .42817 |
| | | 95% Confidence Interval for Mean | Lower Bound | 2.3993 | |
| | | | Upper Bound | 4.6007 | |
| | | 5% Trimmed Mean | | 3.5000 | |
| | | Median | | 3.5000 | |
| | | Variance | | 1.100 | |
| | | Std. Deviation | | 1.04881 | |
| | | Minimum | | 2.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 3.00 | |
| | | Interquartile Range | | 1.50 | |
| | | Skewness | | .000 | .845 |
| | | Kurtosis | | -.248 | 1.741 |
| | HR Manager | Mean | | 3.8000 | .20000 |
| | | 95% Confidence Interval for Mean | Lower Bound | 3.2447 | |
| | | | Upper Bound | 4.3553 | |
| | | 5% Trimmed Mean | | 3.8333 | |
| | | Median | | 4.0000 | |
| | | Variance | | .200 | |
| | | Std. Deviation | | .44721 | |
| | | Minimum | | 3.00 | |
| | | Maximum | | 4.00 | |
| | | Range | | 1.00 | |
| | | Interquartile Range | | .50 | |
| | | Skewness | | -2.236 | .913 |
| | | Kurtosis | | 5.000 | 2.000 |
| | Engineer | Mean | | 3.8857 | .11429 |
| | | 95% Confidence Interval for Mean | Lower Bound | 3.6535 | |
| | | | Upper Bound | 4.1180 | |
| | | 5% Trimmed Mean | | 3.9286 | |
| | | Median | | 4.0000 | |
| | | Variance | | .457 | |
| | | Std. Deviation | | .67612 | |
| | | Minimum | | 2.00 | |
| | | Maximum | | 5.00 | |
| | | Range | | 3.00 | |
| | | Interquartile Range | | .00 | |

| | | | |
|---|---|---|---|
| | Skewness | -1.072 | .398 |
| | Kurtosis | 2.412 | .778 |

**Fig.56**

**Tests of Normality**

| | | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | Job Title general | Statistic | df | Sig. | Statistic | df | Sig. |
| Q7 | Engineering Manager | .183 | 6 | .200[*] | .960 | 6 | .820 |
| | HR Manager | .473 | 5 | .001 | .552 | 5 | .000 |
| | Engineer | .396 | 35 | .000 | .719 | 35 | .000 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As presented in Fig.55 we can report median values of 3.5 (between 'Neither agree nor disagree' and 'Agree') for Engineering Managers, 4.0 ('Agree') for Engineers and 4.0 ('Agree') for HR/L&D Managers. As presented in Fig. 46, an assumption of non-normality can be made as two of the groups (the HR Managers and Engineers) have Sig. values of less than .05.

**Kruskal-Wallis Test**

**Fig.57**

**Ranks**

| | Job Title general | N | Mean Rank |
|---|---|---|---|
| Q7 | Engineering Manager | 6 | 18.75 |
| | HR Manager | 6 | 25.92 |
| | Engineer | 35 | 24.57 |
| | Total | 47 | |

**Fig.58**

**Test Statistics[a,b]**

| | Q7 |
|---|---|
| Kruskal-Wallis H | 1.494 |
| df | 2 |
| Asymp. Sig. | .474 |

a. Kruskal Wallis Test

b. Grouping Variable: Job Title general

The output results from the Kruskal-Wallis Test for question 7 are presented in figures 57 and 58. The variable in question was whether the strategic objectives and goals of the company are understood

by the engineering cohort. As the Asymp. Sig is greater than .05 at .474, we cannot assume there to be statistical variance between the three groups.

**Oneway ANOVA**

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Q7 | Between Groups | .915 | 2 | .457 | .873 | .425 |
| | Within Groups | 23.043 | 44 | .524 | | |
| | Total | 23.957 | 46 | | | |

The results of the oneway ANOVA for question 7 are presented in figure 59. The Sig. value is .425 and thus if a parametric test were fully applicable we would not be able to accept variance between the groups.

# Chapter 5: Discussion

As noted in the methodology section (Chapter 3) a mixed method approach was undertaken in this research. The previous Chapter (Chapter 4) looked mostly at the SPSS tests undertaken on the data produced from the survey results; with some support from the qualitative interviews that were conducted to further elucidate the findings. This Chapter will use the aforementioned mixed method approach to highlight where the information gathered from the qualitative and quantitative elements converge and diverge. Gill *et al.* (2010) note that this approach reflects the complex and multifaceted nature of work and offers the chance to investigate the 'what' of research and also the 'why'. Anderson (2016) observes that 'there is no 'one right way' of going about the analysis of qualitative data. Whereas, with quantitative data analysis there are procedures and processes that provide some degree of confidence in the conclusions, there is no such consensus with the analysis of qualitative data' (Anderson, 2016, p. 235). Building on this, the qualitative approach adopted was to record and transcribe the interviews with the interviewees and to assign descriptive codes to the key concepts and L&D interventions that were mentioned and to look for repetition across interviewees and across organisations. The interview questions were designed to mirror the key concepts investigated throughout the research and in the survey such as alignment, integration, competence development and the communication of organisation goals and objectives, and to hopefully illicit further information from some of those that had taken the survey. Below, the hypotheses bring together both the quantitative and qualitative elements to produce clear empirical evidence around the key issues investigated in this research.

**Hypothesis One: There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that L&D is aligned with the organisation's goals and objectives.**

The Kruskal-Wallis test was undertaken to test the significance levels between the three respondent groups (Engineering Managers, HR/L&D Managers and Engineers) and as the Asymp. Sig was found to be greater than .05, at .182, we cannot assume there to be significant statistical variance between the three groups. We can accept the hypothesis that there is no significant difference between the three respondent groups. However, it is worth noting that the Oneway ANOVA, while not strictly speaking the correct test due to the fact that we are not dealing with parametric statistics, did produce close to a significant result which would have led to the rejection of the null hypothesis that there would be no difference between the groups. It is worth noting as we are dealing with a small sample base, especially with regard to the Engineering Manager and HR/L&D Manager groups and those sampled may not be representative of the broader population working in these roles in the Medtech sector in Ireland. However, the organisations sampled are some of the largest and most prominent companies

and the selective sampling was undertaken to highlight those with responsibility for designing, implementing and experiencing Learning and Development interventions. The median value of belief that L&D interventions are aligned in the organisations of 3.5 (between 'Neither agree nor disagree' and 'Agree') for Engineering Managers, 4.0 ('Agree') for Engineers and 4.0 ('Agree') for HR/L&D Managers, demonstrating relatively close agreement across the three respondent groups about the alignment of L&D interventions.

Looking at the ways in which alignment took place as per the responses from respondents, a number of common themes emerged. Four of the nine respondents mentioned the performance management process as being central to aligning individual goals and objectives with those of the organisation. Four of the nine respondents spoke of a two-level process, perhaps typified by Interviewee D who answered the first qualitative question by saying: "Yes is the short answer I suppose. In terms of how we do it, we have two distinct processes. We have the strategy development process which is ongoing and that would be a normal strategy development process that you would see in any multinational, where some macro objectives would descend down from Senior Leadership at a corporate level and then to various sites, say the site in Cork or in Indiana or in China or wherever, they would then come up with their own site objectives which would align with the macro ones but with differ from each other". However, there was not universal agreement that alignment is in place. Interviewees E and I, both of whom are Engineering Managers, felt that alignment was done on an informal basis and not consciously or methodically in their respective organisations. A problem with the concept of alignment and its practical implications was highlighted by Interviewee G who noted "the manager will say that they align with the goals and objectives and have a formal structure, this is what happens from a formal point of view but from an informal point of view it changes every year, which leads to the two downside implications (a) the manager isn't interested in anything longer than a year if they realise this is what's going on, so it's hard to buy into a three year commitment to develop up real technical competence or (b) they sign up to it but after 6 – 8 months they change their minds."

**Hypothesis Two: There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that L&D is integrated through the organisation.**

The significance levels between the three respondent groups (Engineering Managers, HR/L&D Managers and Engineers) were again examined using the Kruskal-Wallis test and as the Asymp. Sig was found to be greater than .05 at .123, we cannot assume there to be significant statistical variance between the three groups. We can accept the hypothesis that there is no significant difference between the three respondent groups. It is worth noting that the Oneway ANOVA, did produce a

significant result with the Sig. value being less than or equal to .05 at .30 which would have led to the rejection of the null hypothesis that there would be no difference between the groups and accepting that there was a significant statistical difference. Though as noted it is not the correct test and cannot be used it is a more powerful test and therefore it would be interesting to undertake the Kruskal-Wallis test with a larger and perhaps more varied sample base. The median value of belief that L&D interventions are integrated through the organisations in question was 3 ('neither agree nor disagree') for Engineering Managers, 4.0 ('Agree') for Engineers and 4.0 ('Agree') for HR/L&D Managers. As with the look at alignment the Engineering Managers noticeably again have the lowest belief that L&D practices are integrated across the organisation.

The most common way that Interviewees found were being used to integrate L&D across the organisation was the use of Learning Management systems which were mentioned by four of the nine interviewees. Performance management discussions were mentioned by three of the nine interviewees. One of the Engineering Manager group noted that integration of L&D was very good for the technical aspects of the business through online learning interventions but this was lacking when it came to the operation of machinery onsite. Interviewee I noted that in their organisation "while it's integrated, yes within the HR department there is a budget and a policy for continuous learning for staff.  So we do have policies and procedures for training but as regards L&D for the future it wouldn't be as structured as what you might see in larger companies". Perhaps a good summation of the notion of integration and the way that it is done in the participating organisations came from one of the HR/L&D Managers (Interviewee D) who suggested "Yes, they [L&D interventions] are integrated but it's not a machine, it's not mechanistic, so it's not perfectly aligned or integrated or aligned all the time but there would be broad alignment and integration".

**Hypothesis Three: There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that Learning and Development interventions (formal and informal) are improving the professional competence (knowledge, skills and behaviours) of individual engineers in the company.**

The significance levels between the three respondent groups using the Kruskal-Wallis test found the Asymp. Sig to be greater than .05 at .514, we cannot assume there to be significant statistical variance between the three groups. We can accept the hypothesis that there is no significant difference between the three respondent groups. In contrast with the first two hypotheses, when undertaking the Oneway ANOVA the Sig. value was not close to .05 at .341. The median value of belief that L&D interventions are integrated through the organisations in question was median values of 3.5 (between 'neither agree nor disagree' and 'Agree') for Engineering Managers, 4.0 ('Agree') for Engineers and 4.0

('Agree') for HR/L&D Managers. Again it is worth noting the similarity in median values between L&D Managers and Engineers, with Engineering Managers Median being half a point on the scale lower at 3.5. This indicates relatively close agreement in terms of the feeling that L&D interventions are improving the professional competence of individual engineers in the organisation.

The qualitative interviews had two questions around which L&D interventions Engineering Managers and HR/L&D Managers believed were most effective in developing both the technical competence and the soft-skill competence of engineers in their companies. Four of the nine interviewees suggested that Six Sigma training was effective in developing the technical competence of engineers with one out of the four being an Engineering manager and the other three being HR/L&D Managers. Mentoring was mentioned as one of the most useful interventions for developing the technical competence of engineers by three of the interviewees all of whom were Engineering Managers. In relation to the development of the soft-skill competence development there was also a noticeable difference in what the HR/L&D Managers felt was useful in comparison to Engineering Managers. Four out of the nine interviewees suggested that Leadership Development Programmes were effective in developing the soft-skills of engineers; three of these were in the HR/L&D Managers group, while Coaching and Mentoring were mentioned by three out of the five Engineering Managers interviewed, while none of the HR/L&D Managers noted it. One of the Engineering Managers noted that in their organisation the soft-skill competences were not tackled in a formal manner but some of the engineers had been on a Leadership Development Programme. An interesting and somewhat representative observation was made by one of the Engineering Managers (Interviewee F) who suggested "You find that people have to learn the technical first, then you have to learn to operate, when they know the technical and they can operate and they want to move to having more of an impact and influence, then you're ready to talk to them about the softer skills".

**Hypothesis Four: There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that the improvement of individual engineer's competence positively impacts on organisational performance**

The significance levels between the three respondent groups using the Kruskal-Wallis test found the Asymp. Sig was found to be greater than .05 at .565, we cannot assume there to be significant statistical variance between the three groups. We can accept the hypothesis that there is no significant difference between the three respondent groups. As with the previous hypothesis the oneway ANOVA the Sig. value was not close to .05 at .546. The median value of belief that the improvement of individual engineer's competence positively impacts on organisational performance was 5.0 (Strongly agree) for all three sub groups. We can accept that almost all respondents' believe that the

development of engineer's competence is an essential component in delivering organisational performance for Medtech companies based in Ireland.

**Hypothesis Five: There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that the Company measures the impact of Learning and Development interventions on engineers' competence**

The Kruskal-Wallis test related to hypothesis five found the Asymp. Sig be greater than .05 at .633 and therefore we cannot assume there to be statistically significant variance between the three sub-groups. The results of the oneway ANOVA for hypothesis 5 found the he Sig. value is to be .546 and thus if a parametric test were fully applicable would not be able to accept variance between the groups. The median value from the survey data was found to be 2.5 (between 'Disagree' and 'Neither agree nor disagree') for Engineering Managers, 3.0 (Neither agree nor disagree') for Engineers and 4.0 ('Agree') for HR/L&D Managers. It is noticeable that as is a general trend throughout the data that the HR/L&D Manager group had the highest level of agreement and the Engineering Managers had the lowest. Of all the concepts investigated the measurement of the impact of L&D interventions on the competence of engineers met with the lowest level of agreement. This was also reflected in the qualitative interviews.

Seven of the nine respondents pointed to their Performance Management system as being the instrument for measuring the impact of L&D interventions. Only one interviewee mentioned the Kirkpatrick method and said that it was used for some interventions. Two interviewees said that it was not measured in any way. Interviewee C was the only person to mention Return On Investment (ROI) stating "In some cases we do ROI, so we measure the amount of dollars we approve every year, it's called a VIP (Value Improvement Process), so typically, when I came here four years ago I took control of my first VIP project, the ROI on that was over 600 k dollars, so we tend to measure that on a team or a site basis and is reported every month. I think if we started seeing a fall off on our value improvement dollars, that would be a strong indicator. Currently it's a very high level or at a project level". One of the HR/L&D Managers, Interviewee A made a representative comment that "in terms of the interventions we probably aren't so good at assessing afterwards if or how much it has been a success".

**Hypothesis Six: There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that the strategic objectives and goals of the Company are communicated to the engineering cohort**

Using the Kruskal-Wallis test to test the variance between the three sub-groups on their agreement with the statement that the strategic objectives and goals of the Company are communicated to the engineering cohort, the Asymp. Sig was found to be greater than .05 at .365 and therefore we cannot assume there to be statistically significant variance between the three sub-groups. The results of the oneway ANOVA for hypothesis six found the he Sig. value is to be .268 and thus if a parametric test were fully applicable would not be able to accept variance between the groups. The median value for question six was found to be 4.5 (between 'Agree' and 'Strongly Agree') for Engineering Managers, 4.0 (Agree) for Engineers and 5.0 ('Strongly Agree') for HR/L&D Managers. Again the HR/L&D managers were strongest in their agreement with the statement and interestingly the Engineering Managers were stronger in their agreement with the statement than the engineers. Perhaps an indication that those with responsibility for delivering the message feel more strongly that it has been delivered than those who receive it.

The qualitative interviews reflect the general agreement with the statement that the goals and objectives of the company are communicated to the engineering cohort with a variety of methods used. The most popular method appeared to be noticeboards, noted by three of the interviewees, including two HR/L&D Managers and one Engineering Manager. Company-wide, departmental and town hall meetings were also highlighted by three interviewees. Hoisin Kanri methods, Performance Management discussions, PDCA Boards, Balanced Scorecards and Quarterly Business reviews were all mentioned by at least two interviewees. An interesting observation was made by Interviewee G about the communication of goals and objectives and its impact on the development of engineering competences. They noted "what we communicate really effectively is putting the blinkers on in terms of longer term technical competency development and what happens then is that training and development discussions take place between you and your manager and training and development goals and spending are aligned in a business fiscal year with business needs and goals. It is then sowing the seeds for the two fundamental problems that I would offer that exist in developing longer term real core technical competency, which is that it needs a longer time frame and I would say it's a real elephant in the room".

**Hypothesis Seven: There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that the strategic objectives and goals of the Company are understood by the engineering cohort**

The hypothesis can again be accepted on the grounds that the Kruskal-Wallis test found the Asymp. Sig was found to be greater than .05 at .474. The results of the oneway ANOVA for hypothesis seven found the he Sig. value is to be .268 and thus if a parametric test were fully applicable would not be

able to accept variance between the groups. The median value for question seven was found to be 3.5 (between 'Neither agree nor disagree' and 'Agree') for Engineering Managers, 4.0 (Agree) for Engineers and 4.0 ('Agree') for HR/L&D Managers. It is worth noting that the Engineering Managers rated a full point lower on the scale from statement six to statement seven, ranking lower than the engineers, suggesting that perhaps the Engineering Managers do not believe that the goals and objectives are always fully understood by the engineering cohort.

# Chapter 6: Conclusion/Recommendations

This research has investigated whether the best practice around Learning and Development interventions from the academic literature is being implemented in the Medical Technology sector in Ireland. This literature suggests that in order for Learning and Development to maximise its impact it should be vertically aligned with the strategic goals and objectives of the organisation and be integrated horizontally across the organisation. This alignment and integration of Learning and Development interventions should, according to the literature, aid the development of the professional competences of, in this case, the engineers working in the Medtech sector in Ireland. Finally, the competence development of engineers should positively impact on divisional and organisational performance. The literature also suggests that in order for these steps to come to fruition, communication of the organisational goals and objectives is of great importance. The research was underpinned by a resource-based view of the organisation, wherein the internal knowledge and skills in the organisation are viewed as a distinct competitive advantage. The mixed method methodological approach, was characterised by data collected via a survey administered to ten large Medtech companies based in Ireland to get a broad cross-section of the feelings of the three respondent sub-groups of Engineering Managers, HR/L&D Managers and engineers, complimented in turn by interviews with a near even split of interviews with Engineering Managers and HR/L&D Managers.

This mixed method approach allowed for the collection of quantitative data that was analysed and qualitative interviews that allowed for greater illumination of these findings. The hard data was presented in tandem with quotes to elucidate the quantitative findings. Seven hypotheses were created to test whether there was statistical divergence between the three groups. The rationale for this is that it would be very difficult to argue that alignment and integrations was in existence, that engineering competence was being developed or that this competence development was positively impacting on organisational performance if one of these three groups felt it was not being delivered. All seven hypotheses were found to be accepted. There was no statistically significant difference between the groups in any of the seven key questions. Feedback from engineers themselves was solicited from a final question in the survey when they were asked 'Is there any feedback you would like to give on how Learning and Development is delivered in your organisation?'. Similarly, the nine interviewees from the Engineering Manager and HR/L&D Manager groups were asked 'what has the feedback from engineers on L&D in the company been like to date?'. We will now summarise the findings under each of the key areas that have been addressed throughout the research.

**Alignment:**

As noted in Chapter 5 (the discussion chapter) we were able to accept the hypothesis that 'There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that L&D is aligned with the organisation's goals and objectives'. The acceptance of the hypothesis was further supported by the data derived from the survey with 87.5 per cent of respondents either agreeing or strongly agreeing with the statement that 'Learning and Development interventions (formal and informal) in the organisation are aligned with the company's strategic objectives and goals'. It is worth noting that there was a greater belief among the HR/L&D Managers group than among either of the sub-groups from the engineering cohort. There are a number of possible reasons for this, as the sub-groups for Engineering Managers and HR/L&D Managers are both quite small and therefore may not be representative of the general population in those roles across the Medtech sector in Ireland. We must also be cognizant of the fact that the variation may be due to individual perceptions or experiences of the individuals that took the surveys or were interviewed. It is also worth noting the variation in the size and background of the organisations involved. For instance, Company 2, is an indigenous company rather than a multi-national as many of the other companies that took part in the research are. They therefore may not have a comparable budget for Learning and Development or access to the global resources and knowledge available to larger organisations. This is reflected in the interview with the interviewee from Company 2, who is from the Engineering Manager group, who said in answer to the question about whether L&D interventions are aligned or not – "Not formally across the board. We wouldn't have very strong L&D programme within the company. It is intended that we would get to that". It was noted in the literature review (Wognum, 2001; Kepnes and Delery, 2007; Avison *et al.,* 2004) that there is debate in the academic literature as to whether alignment should be seen as a process or an outcome. This was reflected in the qualitative element of the research, particularly with Interviewee I, who noted "So the manager will say that they align with the goals and objectives and have a formal structure, this is what happens from a formal point of view but from an informal point of view it changes every year, which leads to the two downside implications (a) the manager isn't interested in anything longer than a year if they realise this is what's going on, so it's hard to buy into a three year commitment to develop up real technical competence or (b) they sign up to it but after 6 – 8 months they change their minds".

**Integration:**

The hypothesis that 'There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that L&D is integrated through the organisation' was also accepted on the basis of the Kruskal-Wallis test which found that there was not a significant statistical difference between the three groups. It is worth noting that the more powerful but not technically appropriate oneway ANOVA test found there to be significant statistical difference. This is the only example in all the questions of there being a suggestion of significant statistical difference. This suggests that for further research a larger sample group would be worth investigating to see if statistical variation would be uncovered. In the broader sense, again, it was found that the majority of respondents to the survey do believe that L&D interventions are integrated across the organisation. This is reflected in the fact that 78.7 per cent of all respondents either agreed or strongly agreed with the statement that 'Learning and Development interventions (formal and informal) in the organisation are integrated through the organisation. The median values of 4.0 (Agree) for both the HR/L&D Manager and Engineer groups reflect this. The Engineering Managers however had a median value of 3.0 (Neither agree nor disagree).

Drilling down further, three of the Engineering Managers in fact disagreed with the statement, suggesting they do not believe that L&D interventions are integrated horizontally across the organisation. As noted earlier, Interviewee I pointed out that "while it's integrated, yes within the HR department there is a budget and a policy for continuous learning for staff. So we do have policies and procedures for training but as regards L&D for the future it wouldn't be as structured as what you might see in larger companies". This also reflects the point made about alignment, that the variation reported may be due to the nature of particular companies and their experience. A more representative quote from a more representative organisation of the sample population also provided illuminating feedback on the reality of integrating L&D interventions. Interviewee G stated "it's silo-ed, it's structured along the lines of management responsibility, as you then sort of roll out through the company that means that different strands and in different parts of the company this means different things. So individual managers will say that they are integrated though when you look at it as a coherent picture, it's just not there".

**Competence Development:**

Two hypotheses were tested in relation to competence development and both were found to be accepted. These were first, that 'There will be no significant difference between the three sub-groups

(Engineering Managers, L&D Managers and Engineers) in their levels of belief that Learning and Development interventions (formal and informal) are improving the professional competence (knowledge, skills and behaviours) of individual engineers in the company' and second, that 'There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that the improvement of individual engineer's competence positively impacts on organisational performance'. In relation to the latter there was near universal acceptance among all three groups that the development of engineers' competence positively impacts on organisational performance. This was reflected in the median score being 5.0 for each of the three groups. This can be seen to validate the significance of the research as a whole as it demonstrates that the HR/L&D function, the line managers (Engineering Managers) and the employees (engineers) all believe that the development of engineers' competence is a key component in improving organisational performance. In relation to agreement on whether L&D interventions are improving this engineering competence, there was again overall agreement that they are, with 71.5 per cent of respondents either agreeing or strongly agreeing with the statement. Again it was noticeable that all of the HR/L&D Manager group either agreed or strongly agreed with the statement. The median figures were in fact quite close, with median values of 3.5 (between neither agree nor disagree and agree) for Engineering Managers and 4.0 (Agree) for both the HR/L&D Manager and Engineer groups. This is reflected in some of the comments from the engineers in the feedback section of the survey, which were in line with best practice outlined in the Literature Review (Chapter 2), those subjected to L&D interventions were provided with an opportunity to provide feedback. While there were only about 14 engineers who took the opportunity to provide feedback, it was almost universally positive about their experience of L&D in their organisation. This was perhaps typified by an engineer who stated "A number of competence areas are identified (engineering, project management, financial acumen, etc.) and leadership within each function develop L&D opportunities that align to the company and divisional strategy and resulting leadership expectations".

Further exploring the best practice outlined in the Literature Review (Chapter 2), a survey question and interview question was dedicated to whether 'the company measures the impact of Learning and Development on engineers' competence'. The results were striking as demonstrated in the finding/results section (Chapter 4). We can accept the hypothesis proposed in hypothesis 5, which stated 'There will be no significant difference between the three sub-groups (Engineering Managers, L&D Managers and Engineers) in their levels of belief that the Company measures the impact of Learning and Development interventions on engineers' competence'. The Engineering Managers group produced a median score of 2.5 (between disagree and neither agree nor disagree), the Engineers group produced a median score of 3.0 (neither agree nor disagree), while the HR/L&D

Managers produced a median score of 4.0 (agree). We can therefore accept that there are not currently robust practices in place for measuring the impact of Learning and Development interventions on engineers' competence. This was reflected throughout the qualitative interviews. Interviewee D provided a reflective and insightful statement on this issue, stating "Is it done on an ongoing, cohesive basis? Probably that's something we could improve upon and certainly where you would see it most actively happen and not always with the results we would expect would be, I know for instance we have invested a lot in six sigma training but actually when we had someone do a bit of analysis for me on it and looking at it two to three years after the intervention, how many really successful six sigma deployments or projects or problems we had solved using the technique, it was very, very small".

**Communication of organisational goals and objectives:**

Again, two hypotheses related to the communication of the organisation's goals and objectives and their understanding by the engineering cohort were tested and both were accepted on the basis that the Kruskal-Wallis tests could not find any significant statistical difference between the three groups. 89.4 per cent of respondents either agreed or strongly agreed with the statement that 'The company objectives and goals of the company are communicated to the engineering cohort', while 78.8 per cent of respondents either agreed or strongly agreed with the statement 'The strategic objectives and goals of the company are understood by the engineering cohort'. The noticeable difference between the responses to the two statements was in relation to the median score for the Engineering Managers group and the Engineers group. The median value for question six was 4.5 (between agree and strongly agree) for the Engineering Manager group and 3.5 (between neither agree nor disagree and agree) for question seven. While the median was 4.0 for the Engineers group for both questions, suggesting a discrepancy between the beliefs among the engineering cohort as to whether the goals and objectives and both communicated and understood. The qualitative interviews confirmed the findings of the survey with all respondents being generally positive about the communication of the goals and objectives of the company to individual engineers. A representative summary was provided by Interviewee H who said "Yes, each year there are goals and objectives set at a company level and a functional level which get cascaded down to the different departments and then as part of setting the goals and objectives for individuals they're rolled up to feed into those targets for the year for either your function or your group or the site or the company. So they're meant to be fully connected to targets set at a corporate level and are achieved through the individuals goals adding up to achieve them".

**Summary remarks:**

This research found considerable evidence that L&D interventions in the Medtech sector in Ireland are aligned and integrated. This alignment and integration is not an end state and not a perfect practice across all organisations as evidenced throughout the findings. Competence development for engineers was found to be almost universally believed to be a key contributor to organisational performance. There was a general belief among all three cohorts (Engineering Managers, HR/L&D Manager and engineers) that current L&D interventions are improving this competence but equally areas for improvement were identified and will be discussed in the recommendations section. Finally, it was found that the communication of organisational goals and objectives to individual engineers is taking place, which as suggested in Literature Review is a key component in facilitating the alignment and integration of L&D interventions, the improvement of engineering competence and, in turn, improving organisational performance.

**Recommendations:**

This research has created a useful methodological template for investigating the 'state of play' of Learning and Development interventions in a specific industry and for a specific cohort. Future research should aim to broaden the sample base and sample organisations to ensure that the sample within this research is representative of the Engineering Manager, HR/L&D Manager and Engineer groups and that the research is replicable. A methodological limitation encountered as was that much of the research was conducted during the summer holiday seasons and therefore the sample would have been larger as many potential respondents agreed to take part but were then not available to take the survey or to be interviewed.

Concrete examples of how Learning and Development could be improved were evidenced through some of the interviewees. For instance, in order to promote the soft-skill and behavioural competences, one of the organisations found that a move to an equal ranking in their Performance Management system between a 'What' and a 'How' element was seen to improve the way in which projects are delivered. This was allied to a 'round table' discussion between an Engineering Manager and the engineers under their remit where score are given on the 'what' and the 'how'. The organisation in question found this to be a very robust way to assess the impact of L&D on an individual and what their behaviours and the skillset was like after a L&D intervention or series of interventions. Another recommendation coming from interviewees was the impact of creating a technical career path to run in tandem to a managerial career path to facilitate the development of engineers who may be technically very competent but not great people managers. As was noted in the findings and conclusion section, the companies were not found to be especially strong at measuring the impact of L&D interventions. It is suggested that Medtech companies investigate some of the methods and

measures for doing so as outlined in the literature review, such as Anderson's Return on Expectation model, Kaplan and Norton's balanced scorecard or Pawson and Tilley's realistic evaluation CMO model. Interviewee D provided excellent insight into the nature of competence development in a contemporary Medtech organisation and their observations and suggestions are worth taking on board as best practice in this space:

"One of the things we are looking at actively at the moment is transitioning from an environment where traditionally we're training people and they're heading off into the great unknown and they are doing their job and that's it, they are 'trained' in inverted commas. Really the role is to look at training on a more active basis, around performance support, so how do we support someone when they are doing the job right there and then, as an example someone routing a document through the doc management system….., it's not the we're training you, we're going to evaluate you today, tomorrow and in six months' time, it's trying to pre-empt the supports that people will need on an ongoing basis, how do we make sure that they have it at the point of use.

As was noted throughout the research there were perhaps two organisations who felt from the outset that their L&D practices are not at the level of other Medtech companies in Ireland. In order for them to make the jump to the level that other Medtech companies are at, a number of tools would be useful for aligning and integrating their L&D interventions. One such method would be to use Engineers Ireland's Accredited Employer Standard which a number of the organisations who partook in the research have used to align and integrate their L&D interventions. This includes an audit fee of €3250 for the audit and consultation process and would be renewed on either a one, two or three year basis, dependant on the robustness of the L&D practices in place and the improvements made through subsequent audits. This process normally takes between six months to a year for an organisation to get the L&D practices and interventions up to the requisite standard. In the course of the research, Guerra-López and Hicks (2017) work 'Partner for performance: Strategically aligning Learning and Development' provided a number of useful academic insights but also included at the end are a number of useful diagnostic and demonstrative tools that could be used by any organisation to ensure that L&D practices and interventions are aligned with the goals and objectives of the organisation. It was noted throughout the interviews that engineers favour process-based approaches to their work and this could provide a logical and visible approach to ensuring that L&D interventions are aligned. A final recommendation that could be made for organisations based on the experience of an Engineering Manager (Interviewee G), who provided a lot of insight on the limitations of aligning L&D interventions with just the fiscal year as it can limit the long term competences of an engineer, especially the deep technical competence required of engineers in the Medtech sector. The respondent in question noted when HR/L&D managers are looking to address the technical competence of engineers:

"there is a major disincentive for them to get involved in the nitty gritty of trying to develop the technical competences. (A) They don't understand them and (B) it's hard, the third point is then that there is a variety of technical competences, it's not a one box fits all, outside of those initial project engineer type roles, once you get into real technical competences, all of a sudden it's a landscape of tough competency you are trying to build. It's expensive to do it. So when you get into the core, like a CNC programmer, a development path for a good CNC programmer is probably 6 to 8 years, because when you sit down and look at everything that someone needs to be good at that role and what they need to know, it's not a 6 month training programme"

It is a recommended that HR/L&D Managers take the time to familiarise themselves with the requisite technical competences of engineers in their sector and to be cognizant of both the importance and the reality of the challenges in looking to develop these technical competences. The majority of these recommendations are process driven and do not require any major financial investment, it would be envisaged that these recommendations could be implemented in twelve to eighteen months.

**Apendix A – Learning Statement**

From the outset of this research the idea was to create a learning feedback loop between my job as a Learning and Development consultant and the research area. As noted in the introduction, I was aware of a gap in terms of Learning and Development research as to what interventions and practices were delivering organisational results. As the Medtech industry is a thriving and cutting-edge area in Ireland, with a strong emphasis on Learning and Development in my experience, I felt it was the perfect industry to investigate. Having taken a number of modules that were of particular interest to me in the Post-Graduate diploma last year, a big emphasis was placed on the key concepts of alignment and integration. This emphasis, I felt, was mostly dependent on theoretical postulations rather than real world research. The literature element of the research allowed me to gain a deeper understanding of the concepts and the academic debates surrounding them. These concepts are far from uncontested and I was keen to emphasise this in the Literature Review Chapter. Having investigated these initial two concepts, the emphasis on competence development was the logical next step to linking the alignment and integration concepts to organisational performance. Having created this theoretical model and noting from the literature review that there was often a gap in terms of feedback from those that experience L&D interventions I sought to investigate if there was a noticeable difference between those who designed the interventions and those who experience them. The mixed method research seemed like an ideal methodology to do so, and so it proved. The surveys allowed me to get feedback from the three groups described throughout the research and to observe their difference of perception when it came to L&D, competence development and communication. It also allowed me to develop statistical nous around the use of SPSS, a skill that I feel I will be able to further use in my professional life. The qualitative element of the research allowed me to get a deeper insight into the challenges faced by Engineering Managers and HR/L&D Managers working in the Medtech industry. These interviews proved to be a treasure trove of insight and the recommendations section of this research I believe can offer a knowledge sharing opportunity for practitioners in both the HR/L&D and Engineering function in not just Medtech organisations but in organisations that are engineering-led. Finally, I believe that the best practice model that I have created from the academic literature has a strong academic basis that has been investigated in the real world. This has led to the improvement of my own professional competence and can help inform the competence development of other professionals.

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